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"American Engineering Competition."

Our readers are well aware that in the early part of the present year the London "Times" sent a special commissioner to this country to study American methods of production in order to learn if possible the reason for the recent successes of American manufacturers in neutral and even in English home markets. The results of the commissioner's observations are embodied in a series of articles under the title which we have quoted above, and which we have before us.

These articles number sixteen, their length ranging between two and three of the broad columns of the "Times." Their range is very extensive, covering pig iron and steel production, transportation, structural steel work, stationary engines, machine tools, malleable castings, agricultural machinery and the labor question. What strikes us most in reading the articles is the versatility of the author. The articles display a remarkable degree of acquaintance and familiarity with all these branches of engineering; so much so, that it would be impossible to judge from the articles themselves which branch is the one to which the author especially devotes himself, if any. Perhaps, indeed, this very versatility may be an outcome of the different methods of procedure followed in the two countries. Certainly we fancy it would be difficult, under our system of specialization, to find an American engineer who could cover such a field with anything like the intelligence and thoroughness shown in these articles, to say nothing of their literary taste and readable qualities—for, while obviously written by an engineer and while full of information, they are in no sense technical, and may be read understandingly by anyone. In the matter of space given to the various subjects treated, metallurgy and its allied subject of structural steel work occupy the leading place—six of the sixteen articles being devoted to these subjects.

From another standpoint also the articles are noteworthy. We have often before this referred to the spirit of outspoken self-criticism which pervades the English press in these matters, and these articles are, in this respect, perhaps the most conspicuous of any that we have seen. Indeed in his article on American railroads the author says frankly: "In some things English railways are superior to those of other countries, but of these it is not my intention to write. The object of these articles is to point out circumstances in which this country [England] is deficient, or at any rate from which we can learn useful lessons from abroad." Bearing this spirit in mind, we are in a position to make some allowances for the really laudatory character of the articles. The author deliberately came to this country to find good things to say of us, and it is certainly pleasant to know that he found a good many. Moreover, actuated by this spirit, or indeed had he been actuated by a very different spirit, it was perhaps inevitable that his observations should have led him to see our best side. In the very nature of things, and whatever his starting point after reaching these shores, he would hear chiefly of our best plants, and in whatever such plant he might be, his inquiries for others would be answered by reference to those of the same character. Thus while his descriptions of what he saw and his deductions therefrom are no doubt essentially correct, they do not represent the average methods of the country, while the institutions of his own country, from life-long familiarity with them, necessarily present themselves in their average condition to his mind's eye when reviewing them. Certainly we know there are proprietors and managers in plenty among us who are anything but progressive, whose fathers' ways are good enough for them, and to whom a dollar invested in plant looks as big as a cart wheel. On the other hand, there are to our knowledge machine shops in England in plenty which in equipment, methods and products are abreast of anything that we can show, and which can learn no more from us than we can from them.

Our readers will not fail to see that we consider the picture of American industries as shown by the "Times" commissioner to be overdrawn. Indeed, to go from the general to the specific, we could name shops which, to judge from his description, are in the same class with others of the first rank, but which, in point of fact, are in many particulars—as their owners would be the first to acknowledge—badly handicapped with ill-designed buildings and unsuitable sites. In these cases, as in the others, the author seems to have been looking for things to commend, and he found them, as they are there in goodly number; but at the same time the works in many respects are not what one might fairly infer from what has been written.

There is, moreover, one particular in which we think the author of the articles was essentially misinformed. We refer to his statement and conclusions regarding the relations between employers and employees. As regards the subject of disputes with the unions, he is not far wrong, as he acknowledges that such disputes have been frequent and serious here, but in the matter of piece work, he is, we believe, simply mistaken. He seems to have seen most of shops in which piece work is in use, and to have been lucky or unlucky enough to run across those in which, through liberal management, the system works smoothly. From this he concludes that piece work is nearly universal here and that it is preferred by workmen. We believe both these conclusions to be absolute mistakes. We do not believe that, outside of mining and metallurgical work, anywhere near one-half of the workmen

of this country are paid by the piece, and we are sure that among machinists, at any rate, piece work is as unpopular here as it is or can be anywhere. Our readers are well aware of what we believe to be the reasons for their objections to piece work, and that we consider that they contain a large element of justice, but it would be out of place to again discuss the subject here.

We do not mean to imply that the articles do not, on the whole, represent correctly the general situation. On the contrary we are glad to believe they do, and, in fact, unless they are in the main correct, then there can be no reason assigned for many of the trade triumphs which stand to the credit of this country. Many of our initial successes in international trade were no doubt due in large degree to the accident of circumstance; but after making all due allowance for such cases, there remain others, like the Atbara bridge, which can only be explained by the existence of superior methods of production.

A picture may be correctly drawn and at the same time be too highly colored, and this we believe to be a correct analysis of the articles which we have discussed; although in this case the too high coloring is not at all due to defective vision on the part of the painter, but to the conditions under which his work was done, as previously mentioned.

An Aged Student and Graduate.

Most mechanics, as well as men who are not mechanics, think when they have acquired over sixty years of experience in this vale of tears that there is little use in their trying to learn much more. If such a thing is suggested, they take refuge in the old saying that "it is hard to teach an old dog new tricks," and men of that age usually are practically worn out mentally, or they have a very complacent and well-satisfied attitude regarding the knowledge they happen not to have acquired, especially if they have attained some success and are what we call self-made men. One philosopher has said that "de trubble wif most self-made men is dat dey knock off work too soon and commence braggin' 'bout de job." This generally-observed fact makes an instance that came under our observation all the more remarkable. A man over sixty years of age, who in his boyhood served an apprenticeship in a machine shop, but who had no education to speak of, nevertheless rose by his natural ability as a mechanic and as a manager, to be chief engineer of an important and large metallurgical works in the West, and at present occupies the second position of that kind he has filled, with entire satisfaction to his employers and with credit to himself. But feeling the need of a better technical education, he has recently completed a course in mechanical engineering in a correspondence school; thereby showing, it seems to us, not only an unusual degree of mental power and energy, but also a quite unusual and exceedingly creditable mental attitude towards himself and his own attainments.

A young man of our acquaintance had an experience the other day that throws a vivid light upon what we have meant to bring out regarding the prevalent educational methods. This young man's father is a manufacturer of a certain line of machinery. He has spent considerable time in France and other French-speaking countries, and speaks and writes French as an educated Frenchman does. His wife, the boy's mother, also is familiar with the French language, and has as good command of it as she has of English. It has been their custom to use French in their home, the boy having learned it from babyhood and by the natural method by which people usually acquire the use of at least one language. This young man has been studying during the past summer, with a view to entering a well-known university and taking a scientific course therein. He was examined along with hundreds of other young men, the examination being a very rigid, written one. He failed to come up to the standard in French, among other things. That is to say, his paper required him, not to write things in correct French, which he could readily have done, but to write answers to questions about the French language and the French grammar, some of which he could not answer. By advice he called upon the French professor and was introduced by his instructor as a young man who would like an oral examination in French. "Very well," the professor said, and asked the boy a question, speaking in English. The boy answered in fluent and correct French. Other questions were asked in English, and invariably answered in French. Finally, as the boy put it, "I cut loose in French and made a speech to him, which seemed to take his breath away, and which was finally interrupted by his stopping to write a note saying that the "condition' in French was most emphatically removed." Here was a sensible professor who perceived that the boy possessed a better practical working knowledge of the French language than he or the university could ever teach him. He not only had the good sense to perceive this, but also the independence and catholicity of mind that enabled him to overlook mere academic shortcomings and admit the boy to his classes.

It is nearly a generation since the province of Lorraine, or Lothringen, was wrested from France by Prussia, but racial friction is still existant there, and has lately made itself felt in the proposed enforcement of a decree affecting the *personnel* of the ironworks: "Every person placed as director or overseer of work and workmen in the blast furnaces, steel works, forges, rolling mills and foundries must possess *completely* the German language." The masters of forges have resented this as an infringement upon their liberties and as a measure which would deprive them of some of their best leading men. They entered a protest with the local government, which rejected it, and is proceeding to take a census of the German-speaking engineers, superintendents and workmen throughout Alsace-Lorraine. An appeal is now being addressed to the imperial Minister, and if necessary it will be brought before the Chancellor of the empire. This information is derived from a French paper.

A method of extracting the fragment of a drill, punch or other steel tool which has broken off while working any metal but iron or steel, has been exploited by Herr Bornhauser, of Charlottenburg, Prussia. The object containing the broken-off piece is immersed in a boiling solution composed of 1 part commercial alum to 4 or 5 parts water. This solution may be held in a vessel of stoneware, porcelain, copper, etc., but not of iron. The object should be so placed that the gaseous bubbles that form as the alum attacks the metal are easily disengaged. At the end of a short time the fragment of the tool is entirely dissolved. A piece of a steel spring, .16 inch thick, dissolved in a concentrated solution of alum in three-quarters of an hour.

The conception of a horse-power seems very difficult to the lay mind, and many curious ideas are held by laymen regarding it. A man was standing on West street, New York, the other day, watching a steam pile-driver at work. Finally he said to the writer: "How wonderful are the works of man. He can really do anything he sets about doing." We assented. Then he said: "That engine is about 12 or 15 horse-power, I suppose." Again we assented. "Well, now, isn't it wonderful when you think of lifting a weight equal to 12 or 15 horses that high and letting it drop?" We thought it was.

A disastrous flywheel accident occurred, September 15, at the Atlantic Cotton Mills, Lawrence, Mass. When the wheel burst, the flying pieces swept the warp room, one fragment weighing 400 pounds being thrown to the other end of the room, where it instantly killed one of the operatives. Four other persons were injured. The damage to the machinery amounted to $3,000. Four looms were disabled, two beyond repair; the creels of eight warping machines were demolished, the water pipes were smashed and the engine disabled, the flywheel itself being broken to bits.

Commercial Review.

NEW YORK, Saturday Evening, Oct. 6, 1900.

ELECTRICAL AND OTHER MACHINERY.

The reputed slackness of trade and the falling state of prices of dynamos and motors are in sharp contrast with the actual condition of rush that exists in the electrical shops. So far from the principal companies having yet arrived at a point where the factory begins to suffer, the leading electrical machinery concerns are still crowded with work for a long time ahead. The General Electric Company could continue comfortably for more than a year upon its present orders, and the Westinghouse Electric and Manufacturing Company for nearly a year upon its. Six months is pronounced a conservative estimate for the Bullock, and other companies—the Eddy, Crocker-Wheeler and C. & C. have orders on hand that would keep them running on full time for several months. These estimates are average ones and do not imply that prompt deliveries cannot be made by most of the concerns named on many classes of machines. Generally in the cases mentioned the companies are running their works extra hours. The Westinghouse Company is working at night in certain departments and is adding to its machinery equipment. The C. & C. Electric Company is operating all night, and has on its books more orders in number and value now than ever before in its history. Although the orders taken were few at the begininng of summer and are not very numerous now, the company managed to load up at the close of summer. Some good-sized new tools, including a boring mill, milling machine and lathe, were being purchased this week. Machinery recently contracted to be furnished by the company included three special "C. & C. series = parallel systems" for driving large newspaper presses—about 30 to 40 horse-power—for papers in Philadelphia and Los Angeles; a complete power transmission plant for South America involving an 85-Kilowatt generator and about 90 horse-power in motors (eight motors); an equipment for a lithographing establishment in San Francisco, involving fifty-eight special motors and controllers from ½ to 10 horse-power; about twenty-five 5 to 20 horse-power motors to go to England, scattering.

The recession of prices is generally admitted only in an impersonal way, but it is very patent nevertheless. On good authority it appears that in competitive bidding prices of direct-current apparatus are being cut about 10 per cent., or say one-half of last year's advance. In one case it is admitted that figures are down to pretty nearly the old basis. As to the future of electrical demand, prospects are bright, since the present slackness is attributable in no small degree to the election and there is sufficient work in sight to create a good deal of business when confidence returns.

In the electric railway line the Westinghouse Company has quite lately sold over $100,000 worth of motors to the West End Elevated road of Boston and has been awarded a $600,000 contract for equipping an electric road in Ohio to operate between Dayton and Cincinnati, a distance of 65 miles. An electrical outfit for the elevated roads in Brooklyn is to be put in before long and contracts may be given out soon. The motor equipments for the Manhattan elevated have yet to be ordered.

A big order for cars is that just given by the Baltimore & Ohio Railroad to the Pressed Steel Car Company. It calls for 6,000 flat bottom gondolas and will amount to something like $6,500,000. The Pressed Steel Car Company has also just contracted to furnish 300 cars of various sorts to go to South Africa. A report is current that the American Car and Foundry Company will erect a plant in Detroit for making cars of structural steel.

William Wilcox, of the Planters' Compress Company, East Boston, has received an inquiry from Robt. M. de Vignier, superintendent of steam fittings, mill supplies, etc., for Robert W. Blackwell & Co., at Paris, asking for simple non-condensing slide-valve engines of from 15 to 100 horse-power, suitable for running shop machinery.

THE NEW ENGLAND TOOL MARKET.

A man who has recently come to town after visiting the tool factories of the New England States reports that the depression there does not seem to be as deep as it is understood to be in Cincinnati, where so many companies have entered the business in the last few years, confining themselves to narrow lines of product with which they must sink or swim. The demand for machine tools, however, is slack, even there. Manufacturers of small tools, such as taps and dies seem to be faring better. An emery wheel and machine company has noticed that the demand for the machines has sharply fallen off as compared with that of the wheels. They explain that if in a railroad shop is wanted an emery grinder costing but a trifling sum and the project to install it is laid before the proper authorities for approval, the time will be pronounced inopportune for such an addition to the equipment of the works. But whenever $500 worth of wheels are wanted to carry on the operations of the shop, they will be purchased and nothing thought of it.

CINCINNATI REPORT.

This machinery center has been a scene of local celebration which for the nonce, attracted considerable attention from the manufacturer and the retailer and petty jobber. Advice from the machine tool people, however, indicates that in the main these concerns are still working on old contracts, and with some concerns, at least, a little additional new business. One local company, which some years ago, took the lead in a certain type of tools, has it is reported, laid off 250 men. This is attributable more to the methods of the owners than contingencies of the times; for another concern in another portion of the city has been working full force and full time ever since June, with about two-thirds the output of the earlier part of the year. The standard concerns with few exceptions have continued their usual force. There seems to be a sentiment that while business is dragging, there is a healthy, strong undercurrent which will manifest its presence after election.

The R. K. LeBlond Machine Tool Company has laid off a few men, but reports a decided improvement in both domestic and export orders, with inquiries numerous. This firm is figuring on several large orders for delivery in January.

The Bradford Machine Tool Company has orders for two carloads of machinery to go to the Pacific Coast, several single orders from the South and a carload order from Chicago, besides a few scattered ones from Europe and Japan. President George F. Stewart of this company reports prospects for fall trade much brighter than six weeks ago, and says collections with his house are good. Large tools seem to have the call with the majority of Cincinnati concerns.

Vice-President Murray Shipley of the Lodge & Shipley Machine Tool Company, is in the East, looking over trade prospects. This concern is negotiating on three deals; one to include twenty-four, another fifty-four, and another twenty-nine lathes. Export orders last month were good with this company, and the month's business as a whole was better than for any single month of three or four previous ones.

The Cincinnati Machine Tool Company is running full time with full complement of men, although business consists strictly of old orders. This company has at present one hundred and eight machines coming through shop, and of these very few are for stock.

A summary of conditions here may be said to show the antithesis of good and bad. Several firms are doing such a thriving business that their trade is not representative of the general market, but decidedly better than the average. Careful inquiry reveals the fact that not more than three concerns have laid off a considerable number of men and as noted earlier in this letter, this was because of existing methods of managers rather than from necessity.

CHICAGO MACHINERY MARKET.

There is improvement in the market for machinists' supplies and material, as compared with one, two or three months ago. There is less trade than at this time last year. The gains over the summer months are natural, for in the West October and November are regarded as two of the best selling months of the year. The impression exists that trade on the whole is dull. This impression takes its color largely

from the fact that of the two largest implement plants in this city only one has as yet started up for the new season and this in only a moderate way. The other is expected to light its fires about the middle of this month. For the past three years these two implement makers have had scarcely any summer shutdown, though previously it had been customary to close for two or three months in mid-summer. But the correct tone of the market is not reflected by those two institutions. In many other lines of manufacture there is unmistakable activity, especially in what is known here as the country trade, surrounding towns and cities in this and neighboring States. Some sellers of machinists' supplies are already making forecasts of the business for the year 1900 as compared with that of 1899. Several say it will from present indications show little decrease from that of 1899.

Without doubt a conservative spirit pervades the markets. Business is no more active than it has to be, and the more or less satisfactory state of trade is the result of a vigorous constitution rather than of external aids or props. Buying is limited to actual needs usually, the exception being in some kinds of material, which consumers think have touched bottom. They are contracting to some extent for coming wants in those lines.

The Crescent Steel Company reports a continuation of the brisk business they have had all summer. It compares favorably with last year so far, and is therefore wholly satisfactory.

The Northampton Emery Wheel Company says that trade has been excellent with them, especially in the line of grinding machinery, which is being purchased extensively by foundries. In respect to territory, the South at present is an especially lively buyer.

The W. A. Jones Foundry and Machine Company notes an active condition of trade, both locally and in the country. They are running full time, even with their increased facilities and new orders keep coming in as fast as old ones are filled.

The sales of Hanson & Van Winkle Company are running as high this year as they did in 1899 within two or three per cent. This result has been reached in spite of the fact that the bicycle trade, now centered largely in New York, has been lost to this city. It aggregated $150,000 per year, and this company participated largely in the trade.

NEW YORK STATE NOTES.

Gage Machine Works, of Waterford, N. Y., have now fully developed their improved turret lathe, which possesses several novel and interesting features. They are preparing to manufacture them in lots, the first ones having found a more than ready sale, and have just completed one with a square spindle for shipment to China. In addition to their large repair trade with the neighboring knitting mills, they have just developed for the inventor a machine for cutting collars, and a remarkable sewing machine for special manufacturing use. Messrs. Snyder and Metcalfe, proprietors, are meditating extensive improvements and enlargements in their shop.

Holroyd & Co., Waterford, N. Y., report an increasing demand for their taps, in the manufacture of which they have introduced a number of new labor-saving processes. They are adding new equipment to their shop to take care of their increased business.

Burns Hydro-Carbon Burner Company, Fort Plain, N. Y., manufacturer of oil burner furnaces for melting, forging, welding, tire expanding, bolt and nut furnaces and lead bath tempering ones, state that they find the demand for their product to show an encouraging increase, giving the factory work enough to tax its facilities.

Devine Bros. Co., of Utica, N. Y., manufacturers of polishing, buffing and other wheels, have assumed a position of increased importance in the wheel market. They recently absorbed the Compressed Wheel Company, and the shop, erected on the outskirts of the city, is already too small. They report the orders as steadily increasing in number, and an encouraging prospect from their home missionary work throughout the country.

WILMINGTON AND BALTIMORE NOTES.

The American Turret Lathe Company, Wilmington, reports a steadily growing demand for their turret lathes. They have over thirty lathes of different sizes on order, exclusive of a number now approaching completion. They have recently shipped lathes to R. K. LeBlond Machine Tool Company, Lunkenheimer Company, and Triumph Electric Company, of Cincinnati, and four to Europe.

The Hilles & Jones Company, Wilmington, finds that the good times are still with it, and the demand for its machines unabated. It progressed through the hard times, working full time, and is now working overtime.

The Detrick & Harvey Machine Company, Baltimore, reports a continued press of orders, no decline on account of proximity of election being apparent. It is now running almost exclusively on its standard tools—open-side planers, universal drilling and boring machines, bolt threaders, and the newly designed automatic nut facer. It is still operating under night shift, finding this still necessary despite the additional facilities recently provided. C. L. Riggs, of this firm, has recently returned from an extended trip through Europe, and reports encouragingly of the foreign market for first-class American machine tools.

Ott. Mergenthaler & Co., Inc., of Baltimore, also report an unabated demand for their reamers and special parts, which keeps the shop working full time with full complement of men, a condition that has remained unchanged for a long time past. Several important developments in the perfection of certain machine tools have been delayed, owing to the necessity of filling the numerous orders for their standard products, the steady demand for which fully occupies the shops.

Robt. Poole & Son Co.'s works at Baltimore, are full to overflowing and no diminution in the number of orders in sight. They are now about completing the great centrifugal pumps for the new dry dock at Newport News—the largest dry dock on the Atlantic Coast. These pumps have delivery pipes 5 feet in diameter. A large amount of mining machinery work is also going through the shops.

Quotations.

NEW YORK, Monday, Oct. 8, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons	
No. 1 X foundry	$16 00 @ $16 50
No. 2 X foundry	15 25 @ 16 00
No. 2 plain	14 50 @ 15 00
Alabama Irons:	
No. 1 foundry, or soft	15 75 @ 16 25
No. 2 foundry, or soft	14 75 @ 15 25
No. 3 foundry	14 25 @ 14 75
Foundry forge	13 00 @ 13 50

The above prices for Alabama irons are based upon the new freight rate, $3.75 per ton, making a reduction to consumers of 50 cents.

Bar Iron—Base sizes—For good refined brands on dock, 1.40 @ 1.55c., and 1.65 @ 1.80c. for same from store.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel — Base sizes — From store, 1.60c. @ 1.70c.

Cold Rolled Steel Shafting—Base sizes —From store, 2½ @ 2¾c.

Copper—Lake Superior, ingot, in carloads, 16⅞c. @ 17c.; electrolytic, 16⅝ @ 16¾c.; casting, 16½c. @ 16⅝c.

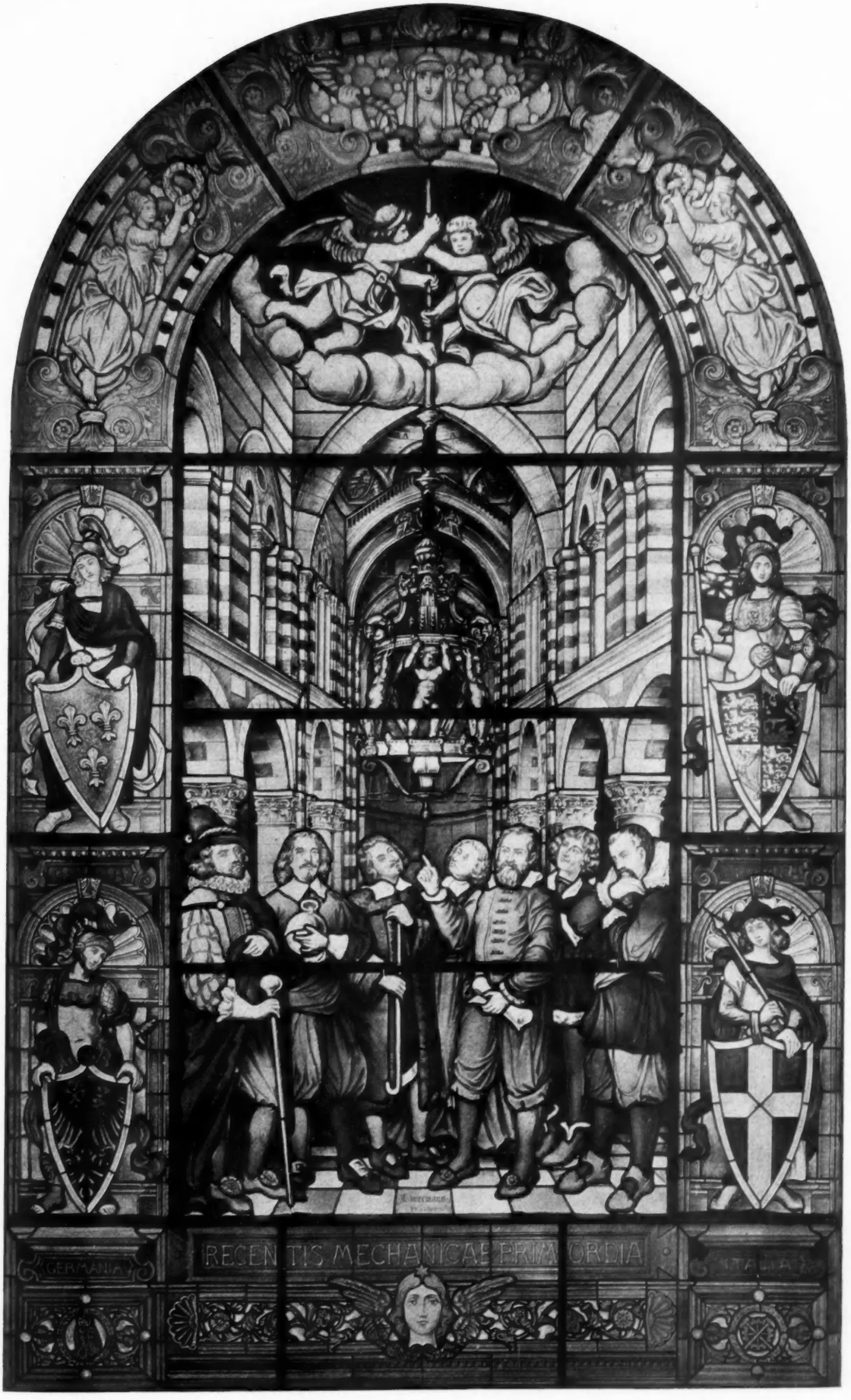
Pig Tin—28¾ @ 29c. for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½ @ .05c. extra for carloads.

Spelter—Prime Western, 4.10 @ 4.15c., New York delivery.

Antimony—Cookson's, 10½ @ 10¾c.; Hallett's, 9⅛c.

It is said to have been learned by directors of the Carnegie Company that operators of the principal American railroads have held a secret meeting in New York and agreed among themselves not to pay more than $22 a ton for rails for next year. The Carnegie directors on their part assert that the $26 rate fixed by the rail pool will be maintained, and that if the railroads insist upon $22 rails they will have to make them themselves. What is sauce for the goose is evidently sauce for the gander.



PROFESSOR REULEAUX'S STAINED GLASS MEMORIAL WINDOW.

Professor Reuleaux's Window in Commemoration of Scientific Achievement.

When calling at the residence of Professor Reuleaux in Berlin, three years ago, I was much interested in a beautiful stained glass window near the foot of the stairway. This window is commemorative of Galileo's discovery of the properties of the pendulum. At my request the Professor promised to have it photographed and to send me a print. I have just received the promised photograph, and it is reproduced herewith. With it came an explanatory letter, extracts from which follow:

"The large window represents the beginning of modern mechanics, about the year 1600. It shows the scene under the dome of the cathedral at Pisa with Galileo explaining to his fellow scientists (somewhat contracted in point of time) how he, as a student, during the long mass, had, by counting them on his pulse, found the oscillations of the chandelier (still existing) to vary in time with the length of the pendulum, but to be equal regardless of the amplitude, and how he, instigated by these observations, had discovered the law of pendulum movements. He is surrounded by scientists representing the four countries that created the new mechanics—so different from the philosophy of Aristotle. England is represented by Lord Bacon, at the extreme left; Germany, by Otto von Guericke, who is shown with his Magdeburg hemispheres in his hand; by Copernicus, who stands just behind Galileo, and by Kepler at the extreme right. Besides Galileo, Italy is represented by Torricelli, who holds his barometric tube in his hands; while France is represented by Pascal, who was the first man in France to acknowledge Torricelli's discovery, and who stands more in the background.

"In the border are to be seen the genii of the four countries with their shields, while over them are two figures representing Fame, with appropriate wreaths of laurel. At the extreme top is Fortune with her horn of plenty. As a check to the haughtiness of the human intellect, two little angels are shown above the clouds in the act of swinging the pendulum.

"Many years ago I composed this picture in my mind and collected the portraits as well as the photographs of the cathedral and chandelier at Pisa. When I built my dwelling, Professor Linnemann, of Frankfort-on-the-Main, our leading artist in stained glass, made me the window, and it is a masterpiece. In the photograph the faces are somewhat pale and faded, although they are lovely in the original. We did our best in photographing them, but our efforts to obtain better results were in vain."

I am sure the photograph of this window will interest very many of our readers; not merely for its own sake, but as well for the reason that it is the design and the daily companion of a man whom so many Americans have reason to and do regard with feelings of the very highest esteem. F. J. M.

Prizes at Paris.

We probably sufficiently indicated in the preceding issue our estimate of the Grand prize awarded the entire exhibit of United States journals at the Paris Exposition, and our intentions concerning it. Some of our contemporaries also are moved to express themselves in an interesting way in the matter. The following from the "Electrical World and Engineer" is not bad reading:

"It is sad to see that some of our multitudinous American contemporaries who 'also ran' are rather pluming themselves on their 'Grand Prix' or their gold medal. Far be it from us to cast even the suspicion of a shadow of gloom over their unsuspecting joy. The love of a chromo is deep-seated in human nature, and the polite desire in Paris to satisfy it is not to be lightly condemned. We note, however, that our esteemed contemporary, the 'New York Commercial,' in discussing this right conferred on a few hundred papers to announce and parade the Grand Prix, says: 'Naturally only the most insignificant class of publishers would care to take advantage of this privilege, and if any should do so, the absolute ridiculousness of the award would thus be only the more sharply emphasized.' Alas! those journalistic prizes of 1900 must pass into obscurity with the straw hats of the summer that is past, and not be blazoned on the ancestral walls with the helmets whose oriflammes have gleamed in the front of glorious victory."

The Paris Exposition—XII.

THE BROWN & SHARPE MANUFACTURING COMPANY'S EXHIBIT.

The Brown & Sharpe Manufacturing Co., of Providence, R. I., have taken a prominent part in every exhibition of importance since the one held in London in 1862, and it is no exaggeration to say that their exhibit at Vincennes, in the American machinery building, is a liberal education, not only in machine-tool design and construction, but in the arrangement and management of an exhibit of machine-tools as well. In show cases ranging along the front of their space they have, besides numerous small tools, such as micrometer calipers, graduated steel rules and gages of all kinds, parts of their machine tools which have been finished in the ordinary manner, and are exhibited to show the degree of finish and accuracy of fitting which is the standard of their work. For instance, in one case there is a hardened and ground spindle for an automatic screw-machine, which, although it is all right in every other respect was accidentally ground half a thousandth too small in one of its dimensions and was therefore condemned. Small parts that are intended to slide or turn upon those portions of the spindle that are correct to gage fit it beautifully and have that soft and smooth feeling when

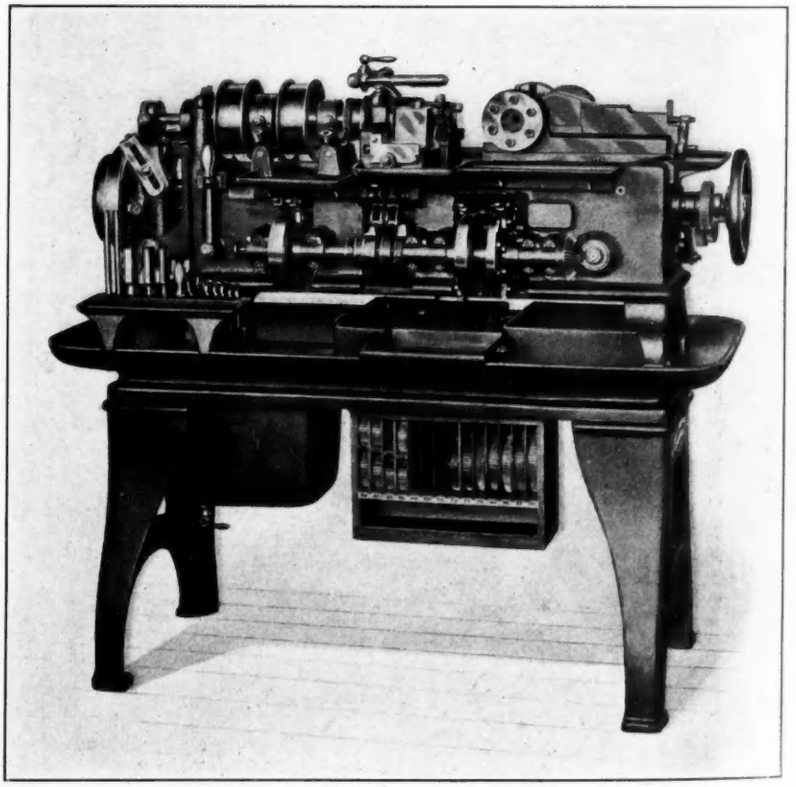


FIG. 75. AUTOMATIC SCREW MACHINE SHOWN AT PARIS BY BROWN & SHARPE MANUFACTURING COMPANY, MAKING COLLAR BUTTONS.

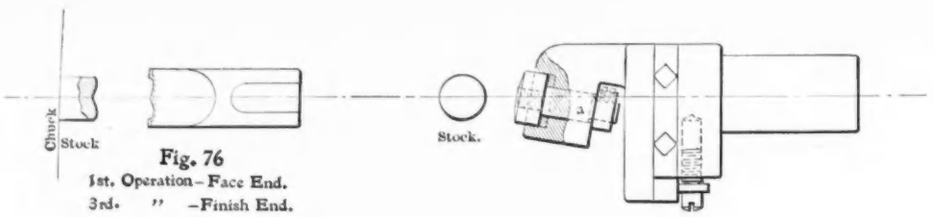


Fig. 76
1st. Operation – Face End.
3rd. " – Finish End.

Fig. 72
2nd. Operation – Roll Letters.

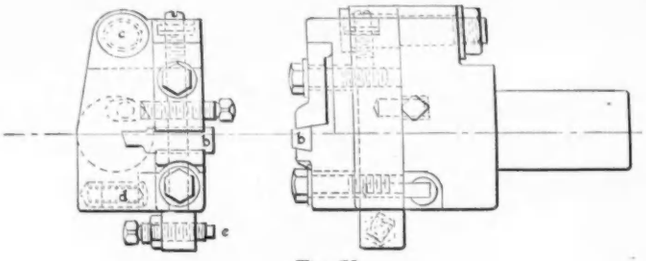


Fig. 78
Swing Tool Holder
4th. Operation – Finish Forming.

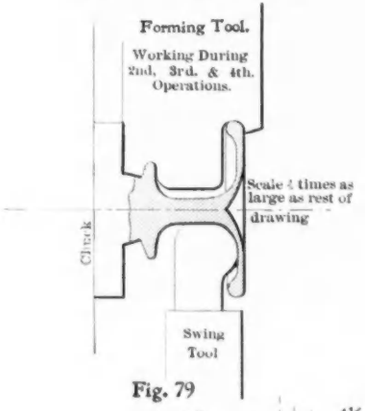


Fig. 79

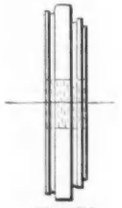


Fig. 80
Forming Tool – (Roughing) used in Back Cross Slide.

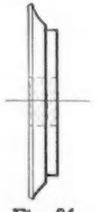


Fig. 81
Cutting Off Tool used in Front Cross Slide. 5th. Operation.

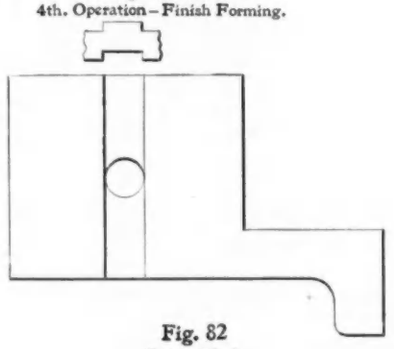


Fig. 82
Rising Block.

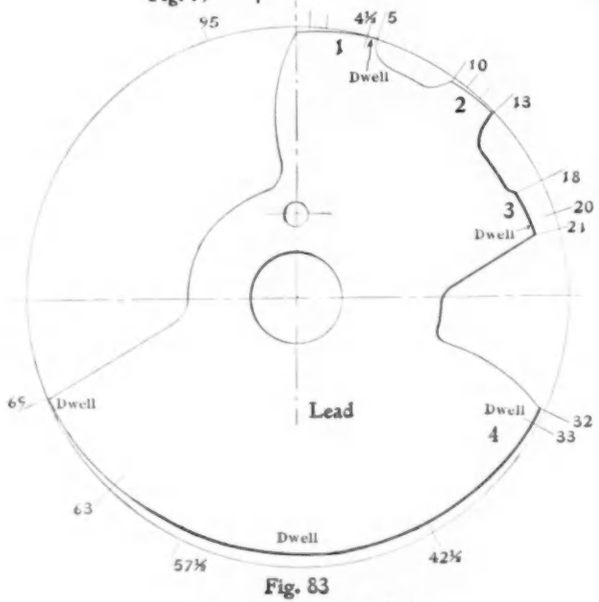


Fig. 83
Cam – Operating Turret Slide.

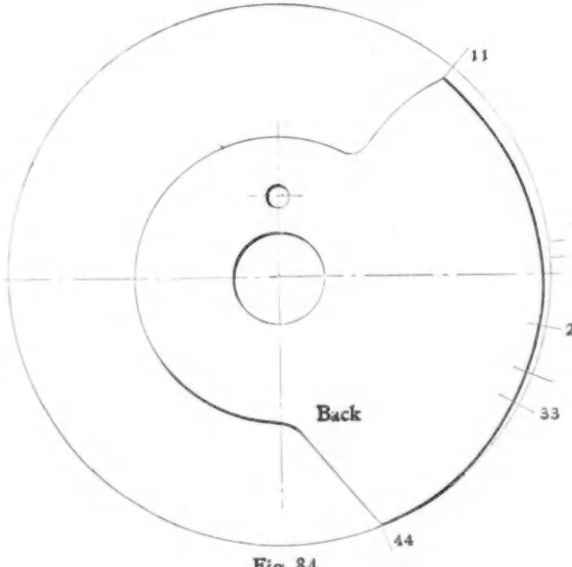


Fig. 84
Cam – Operating Back Cross Slide.

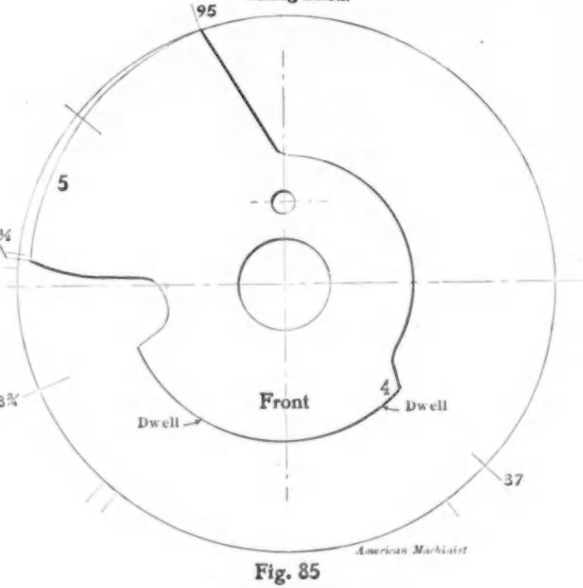


Fig. 85
Cam – Operating Front Cross Slide.

DRAWING OF TOOLS USED ON THE BROWN & SHARPE AUTOMATIC SCREW MACHINE IN MAKING THE COLLAR BUTTON.

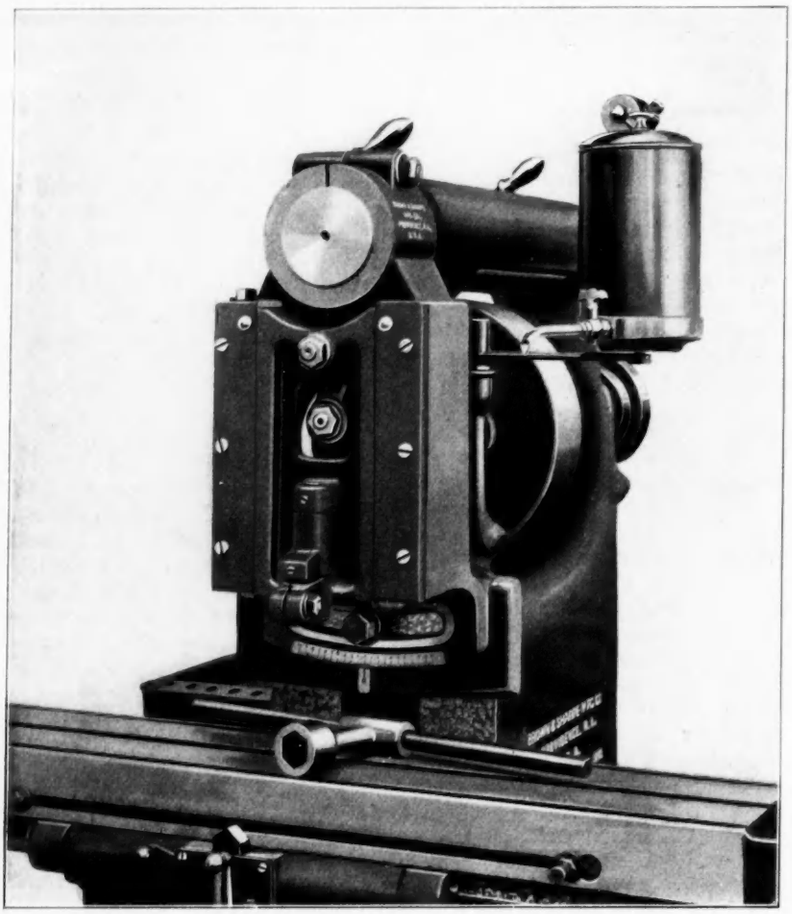


FIG. 86. SLOTTING ATTACHMENT FOR UNIVERSAL MILLER SHOWN AT PARIS BY BROWN & SHARPE MANUFACTURING COMPANY.

moved by hand that can be obtained in no other way than by accurate, true and smooth grinding. I do not speak of this merely to call attention to the good workmanship (which, of course, is not confined to the products of this firm), but rather to call attention to the fact that the exhibition of this piece of work in that way and under the circumstances named impresses upon those who examine it and who are capable of judging such things, a more vivid idea of what their workmanship really is, than could be done in perhaps any other way. They exhibit also in these cases, among other things, two unusually large mllling cutters; one of these being solid and measuring 6x24 inches, and the other with inserted teeth and measuring 8x24 inches. There is also a worm-gear hob that was made for the Newport News Shipbuilding establishment and is 8 inches pitch diameter,for a gear of 2½ inches circular pitch with 54 teeth; the hob being 9½ inches diameter outside and 8½ inches long. A 4P gear tooth cutter of their make is shown, which in the shop of one of their customers, has cut through 2.41 miles of gear teeth, and although it is well worn is still serviceable.

A SCREW MACHINE JOB.

There are many examples of curious screw-machine work that have been made on their machines by various parties or by themselves in testing sets of tools made for customers, but the thing which attracts most attention from the crowd is the automatic screw machine that is at work making collar buttons from the brass rod; the buttons dropping from the machine complete; even to having upon the bottom of them the legend, arranged in a circle, "Brown & Sharpe, Paris, 1900."

In our issue of June 1899, we published a full illustrated account of the Brown & Sharpe automatic and there is no need to go over the entire ground again at this time, but in order to understand the nature of the work done on this collar button job that attracts so much attention at Paris, it will be useful to have an engraving of the machine before the reader and one is therefore shown in Fig. 75. It may be remembered from our former description that one of the main features that distinguish this from other automatics, is in the fact that when the machine is set up for a given job certain cams that are made for the purpose are slipped on to shafts and fastened in place and the machine is immediately ready for business without the possibility, or at least with very little liability of mistakes being made, and with comparatively little necessity for trial cuts and repeated adjustments; the cams, once properly made and put in place with proper tools and the machine "does the rest."

Figs. 76 to 85 inclusive, are made from a drawing showing the nature of the toolmakers' job for producing the collar button. At the bottom, Figs. 83, 84 and 85, are the cams which are designated on the drawing to show their functions, and the figures placed around the circles that define the extreme radii of the cams indicate the angular movement to the various points, in hundredths of a turn, from an initial point taken at the top; this decimal division of the circle being evidently taken instead of the usual one of degrees, because of its greater convenience, especially when taken in connection with the gear-wheel computations that arise in connection with the driving of the cam shafts, and the fact that in designing tools for a given job it is necessary to assign a given number of spindle rotations to each cut and the ratio between cam speed and spindle speed being known, a glance at the figures shows the number of rotations of the spindles for any given operation.

The chief novelties of this job come from the facts that it has the letters rolled on the bottom of the button, and that there is an undercut at the bottom of the shank as shown at Fig. 79. At Fig. 77 is shown the tool for rolling the letters. It is a simple affair consisting of a shank *a* set in a holder at an angle, as shown, and having a head with a beveled face extending around its upper surface on which the letters are cut in relief. Placed at an angle, in this way the steel letters formed on the tool contact with the work at one side only, and the work rotates this head so that the action is a continually progressing one, exactly the same as though the line of reading were straight and the letters were formed on a disk rolled over the work in a straight line, except that, in this case, the stamp can go over the work as many times as are thought to be desirable without repeating or reversing any motion. The burr thrown up by this operation is removed by a subsequent one so that the button as it comes from the machine is a smooth and finished job.

The holder for the tool that does the undercutting is shown at Fig. 78, where the tool itself *b* is held in the manner shown within a piece that is pivoted at the top at *c*, the swinging piece being held outward by the helical spring at *d*, and at the proper time forced inwards by the piece, Fig. 82, which is called the rising block, and is placed under the tool on the front slide to contact with the set-screw *e*. Thus it will be seen that the movements of this tool are the result of the action of two different cams, viz.: those shown at Figs. 83 and 85, the portions of the cams which do this work being designated by the number of the operation, 4.

The various operations take place in the following order:

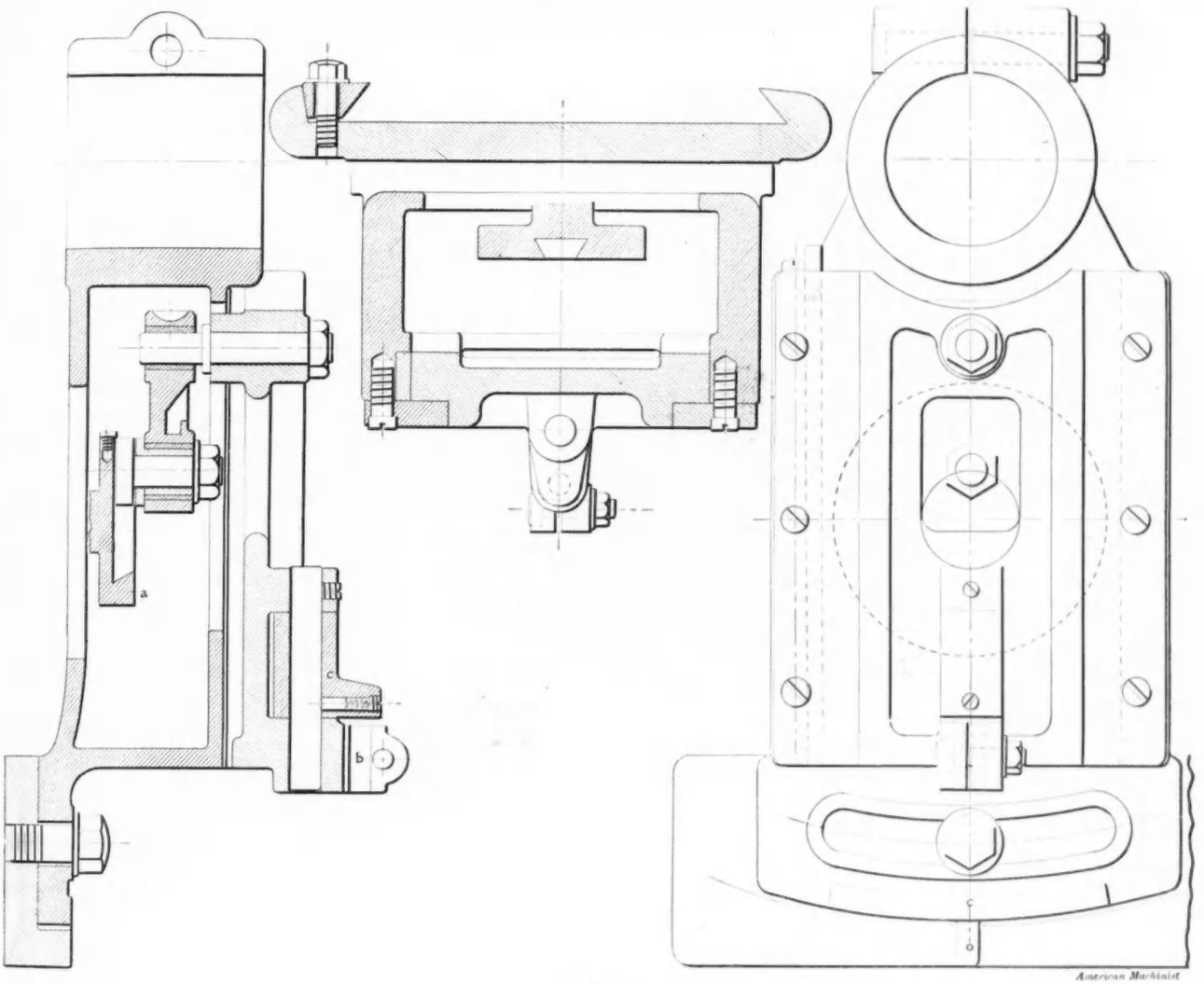


Fig. 87

SLOTTING ATTACHMENT FOR UNIVERSAL MILLER.

First—The turret slide advances with facing tool in position forming the end or base.

Second—The turret is revolved, bringing the rolling tool in position, and the name is rolled in; at the same time the back slide carrying the formed tool for roughing the shank and finishing the edge of top and base, advances into position and commences to remove stock.

Third—The turret is revolved, bringing a second facing tool into position to remove the burr caused by rolling the letters in.

Fourth—The turret is revolved, bringing the swinging tool into position; the front slide advances and the rising block clamped under the tool-post swings the tool into position to under-cut the base, and dwells until the turret slide drops back the required depth. (The shank is now roughed out and the back slide drops back.) The turret dwells in this position until the front slide swings the tool to the diameter of the shank. The front slide dwells in this position and the turret slide advances, making the shank the required length, then dwells until the front slide drops back, allowing the swinging tool to clear the work, and then the turret drops back.

Fifth—The front slide advances and the piece is cut off with the circular form tool held in the tool post. During this operation the turret is revolved twice, bringing the first tool into position. The stock is then fed, ready for the next piece.

Spindle speed is 1,440 revolutions per minute; 576 revolutions are required for making one piece, and the average production for a working day of ten hours is 1,350.

This job and the tools for doing it were not devised for the purposes of the exhibition, but it is a job for which the Brown & Sharpe Company had some time before furnished the machines and tools to a company which either has or will put the buttons upon the market. The rapidity with which the machine turns out these buttons and the extreme quickness with which it makes what are known as the idle movements, are very impressive, and it is safe to say that for a long time many people all over Europe will be showing these buttons to their friends and telling about the wonderful American machine which makes them all by itself, separates them from the chips and oil and delivers them, finished, ready for polishing.

A SLOTTING ATTACHMENT FOR THE MILLER.

Among the newest things shown by this firm is the device represented by Figs. 86 and 87. This is for slotting out die work, although our friend Tecumseh Swift would insist that "slotting" is the wrong term to use, and that it ought to be called vertical planing. This attachment is not, however, confined to vertical planing, and, in fact, when used on die work, would probably seldom plane anything except at a slight angle to give the required clearance. The photograph shows the attachment in place on the machine, and the drawing Fig. 87 shows how it is made. The frame of the device fits over the projecting end of the overhanging arm, which is reversed for the purpose, and on this arm as a center can be swung to any angle up to 10 degrees either side of the vertical by a graduated arc and clamped to a bar which

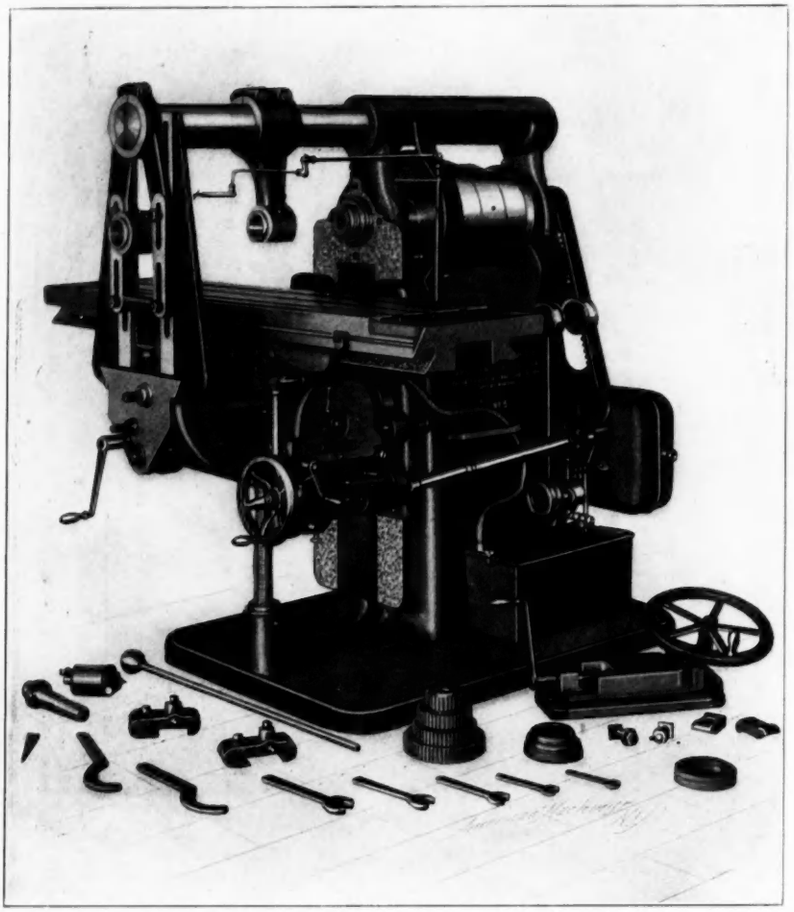


FIG. 88. PLAIN MILLER SHOWN AT PARIS BY BROWN & SHARPE MANUFACTURING COMPANY.

clamps to the front of the column of the machine the same as the knee does. A taper shank which is part of the device fits into the spindle and has at its outer end a small crank disk *a* which carries a crank pin that can be adjusted for different strokes, and by means of a short connecting rod gives motion to a tool-carrying slide which holds a round shanked tool in the place provided at *b*, and which is backed up to keep it from slipping by the swinging piece *c*, which has a lug upon it that can be brought over the tool. The device was first made for use in the Brown & Sharpe shops, and was found so useful for finishing out the corners of dies and other work not accessible with milling cutters that it was decided to place it upon the market. Of course made in this way the attachment is used in connection with, and has all the advantages of, the various platen movements of the machine.

SOME PARTICULARS ABOUT A NEW PLAIN MILLING MACHINE.

The plain milling machine shown at Figs. 88, 89, 90 and 91 is the largest of its class built by the Brown & Sharpe Company, and is of new design. This machine has a double back-gear arrangement by which, with its three-step pulley and a two-speed countershaft, eighteen different rates of speed are available, varying from 10 to 404 turns per minute in geometric progression. These gears are placed under the spindle as shown at Fig. 89, which is a section through the spindle, bearings and gearing. In the position shown the drive is through the cone pinion *a* to *b*, *c*, *d*, *e*, *f* and *g* to the spindle gear *h*, and the ratio is 13.3 to 1. It will be seen that both the back-gear quills are fitted to shafts with eccentrics at the ends, so that they can be engaged or disengaged in the usual manner. On the back-gear quill *A* there is a disk *B*, which, when it is in the position shown by the drawing, prevents the clutch *C* from being thrown into engagement; but throwing out the gears *d* and *e* in the usual manner also lowers this disk *B* so that the clutch can be engaged, and when this is done, the drive is from the pinion *a* through the gears *b* and *g* to *h*, and the ratio is 3.677 to 1. The upper or first back-gears can of course also be thrown out of engagement in the usual way.

Fig. 90 is a section through the knee of the machine, showing the arrangement of the gearing for producing the various motions by hand and automatically. The table is driven by a pinion at the top of the vertical shaft *A*, and this shaft is turned by hand by means of the shaft *B*, or for the automatic feed by the pinion *c*, which is at the end of a shaft which is driven by worm gearing, and when this feed is disengaged, it is not done by dropping the worm out of engagement with the wheel, and thus leaving the platen unlocked; but the worm retains its hold upon the wheel and the platen remains locked in the position it was in when the feed was disengaged. It will be noticed that ball-thrust bearings are used, and also that there is thorough provision for taking care of an abundant flow of oil or other lubricant that may be run on to the cutter; a pump being provided for supplying it from a tank, to which the system of conduits returns it as fast as it flows from the work.

A "Renold" chain with sprocket wheels is used to carry the feed motion down from the spindle to the feed-gear-box at the rear of the machine, in which are gears that give twelve rates of feed varying from .008 to .314 inch per turn of spindle (in geometric progression), and the mechanism by which the feed is automatically disengaged and reversed when desired is shown at Fig. 91. The feed is automatically tripped by the lever *A* moving the eccentric sleeve *B* bodily along and disengaging the clutch *C*. This clutch *C* is constantly revolving, being connected through the universal joint, the feed gears and the chains to the spindle. The eccentric sleeve is used to reverse the feed engaging directly from gear *D* to gear *E*, or through gear *F* if a reverse feed is desired. It is operated by the lever *I*. The fine hand feed for table, with graduations reading to .001 inch, is operated by the hand-wheel shown in the photograph, and through the gear *F*. When the quick hand feed is used, the worm *G* is thrown out of mesh with the worm-wheel *H* by the eccentric *J*, and the table is then moved nearly 4 inches to each turn of the crank on the front of the knee. The cross and vertical power feeds are connected from gear *G* through the train of gearing shown. This train of gearing can be disengaged when not in use. The table is 66¼ inches long by 18 inches wide, and has an automatic feed of 48 inches. Other interesting features of the Brown & Sharpe exhibit must be left until another time.

F. J. M.

Specifications—The Ways of Consulting Engineers and Contractors.

BY W. H. BOOTH.

Manufacturers sometimes complain that an engineer who draws up a specification will not allow it to be departed from in any particular, even when he may admit that the departure would be an improvement. This is not a nice attitude to take, and is apt to make the engineer look foolish. At the same time manufacturers are themselves to blame for the trouble. They approach the engineer and suggest a change. The engineer recognizes the reasonableness of the suggestion and accedes to an alteration that probably is a dis-

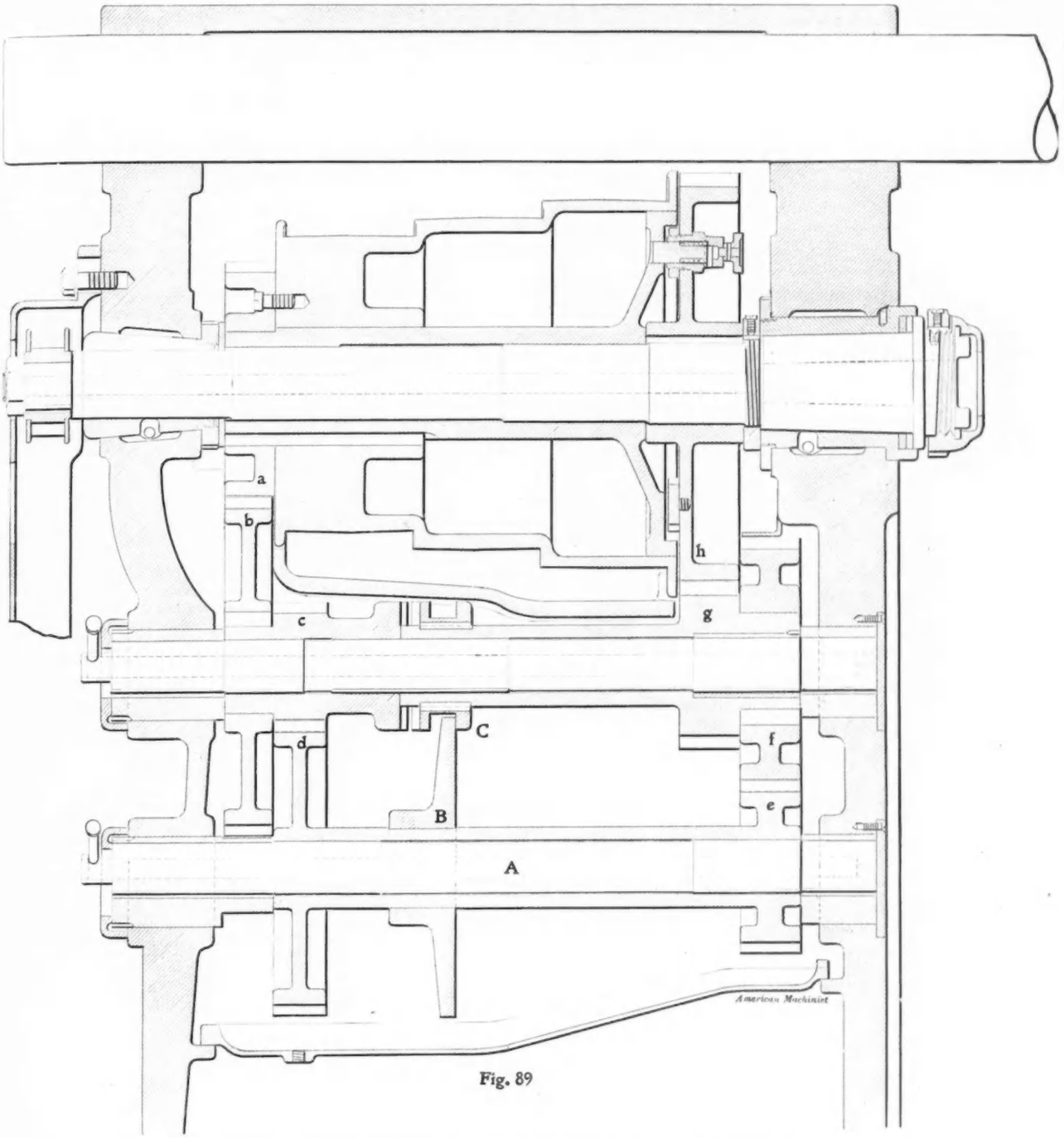


Fig. 89

SECTION THROUGH SPINDLE AND BACK-GEAR OF PLAIN MILLER SHOWN AT FIG. 88.

tinct improvement, while at the same time it enables the manufacturer to save something in cost. Yet in spite of this, unless the engineer has been exceedingly careful to safeguard himself, he finds that his acquiescence in a requested variation from the specification is charged as an extra. Not only so, but it is apt to be looked upon as an indication of weakness, whereas really it was simply an acknowledgment that the engineer was not ashamed to learn and knew a better thing when he saw it. But the contractor calls it weakness and proceeds to make unauthorized changes from specifications in the hope and expectation that they will be either overlooked, condoned or accepted in cases where material is badly wanted. It is, perhaps, because of this attitude of contractors that engineers have got into the way of refusing any departure however reasonable.

Contractors have other disagreeable ways. We all know that after a contract has been formally entered upon, alterations are made and even different material is allowed. This may occur in quite a legitimate manner, yet unsuccessful rivals are always on the *qui vive* to make a great shout in public about any departure from specification. Often probably such departure may not be fair and above-board, but it will sometimes be so. A better material might become available. Is it to be passed over purely for the sake of sticking to specifications? Yet no contractors are so severe on this as those who would be first to take the course themselves.

It is laid to the doors of the average consulting engineer on this side that by writing his own specifications he has done much injury to British trade, because he has checked the standardization of plant and thereby spoilt all chance of cheap manufacture. There is a good deal of truth in this, but it is not well to hear the tale wholly from one side. On one occasion I required some machinery and I

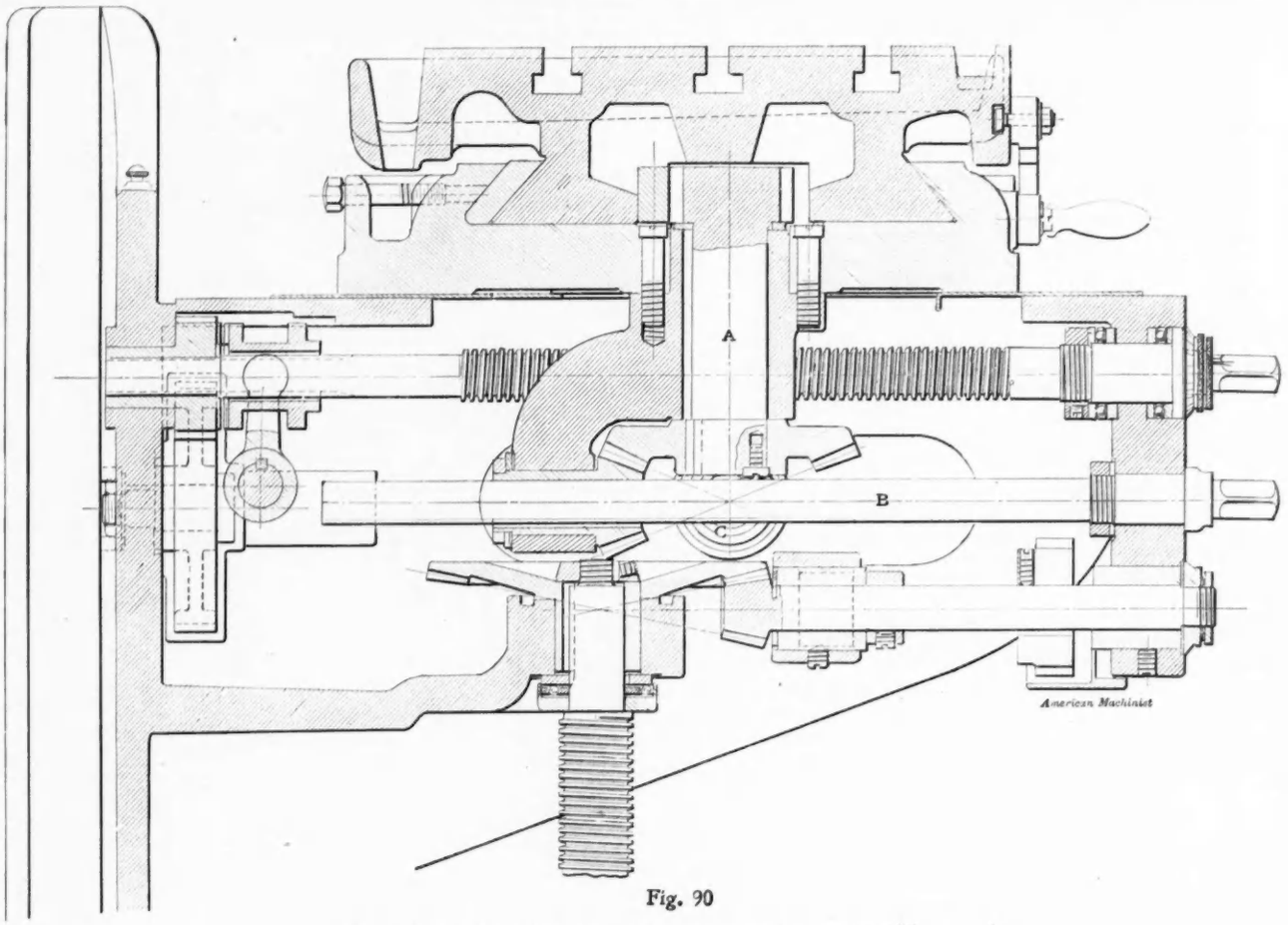


Fig. 90

SECTION THROUGH KNEE OF PLAIN MILLER SHOWN AT FIG. 88.

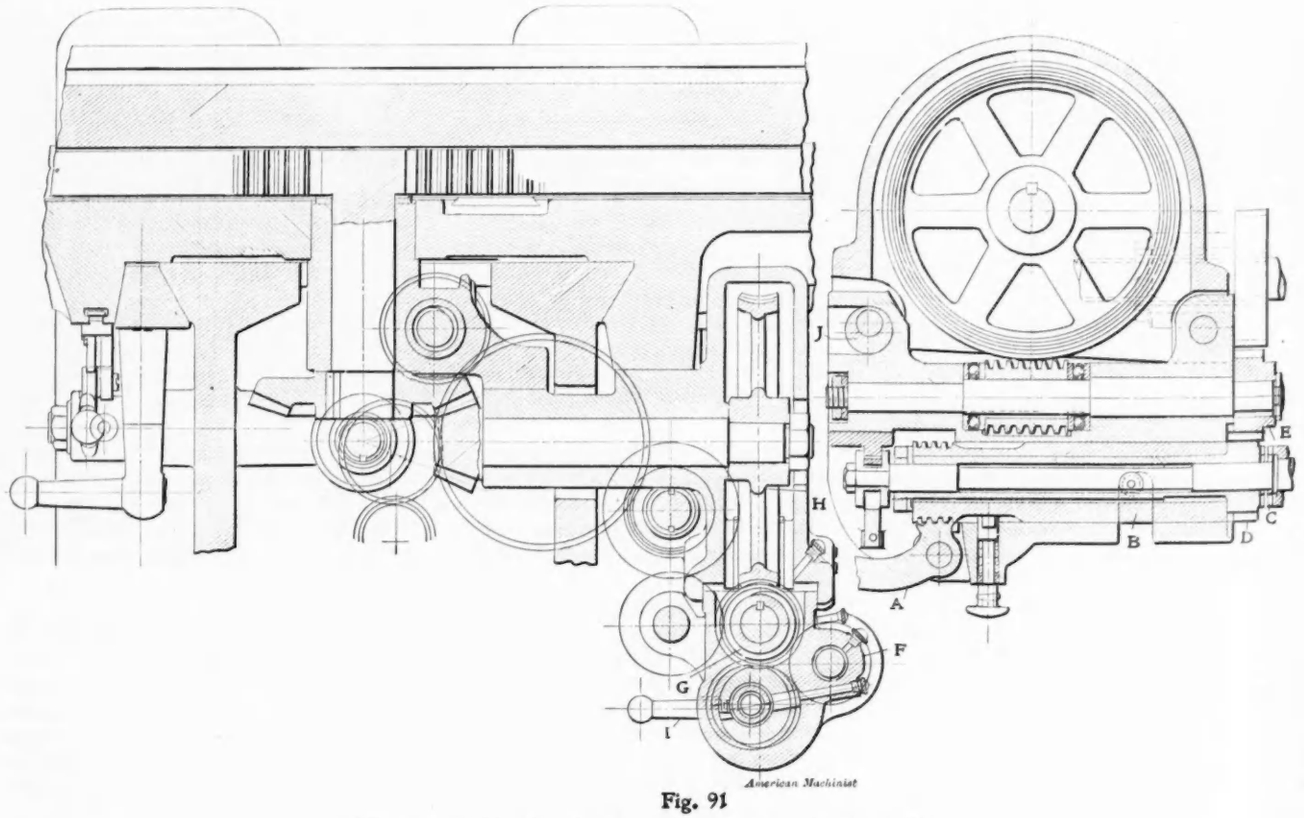


Fig. 91

SECTION THROUGH TABLE OF PLAIN MILLER SHOWN IN FIG. 88.

prepared a general specification calling for very little outside any maker's standard designs, and such little not beyond the change in a material and that to be obtained in open market of standard sizes. I asked for a schedule of leading dimensions and a print of what was supposed to be supplied, sent the specification to six or eight of the best known makers of the article in question and obtained about one tender and some requests for detail drawings that I had not made, of course, as I was prepared to accept any reasonable design. While I am prepared to acknowledge that engineers are often unreasonable and behind the times in their knowledge of practice, I am equally sure that contractors are much to blame. No matter how an engineer may draw up his specification he will be grumbled at, often unreasonably, and he finds himself in the position of the old and young man, and the ass of Aesop who were criticised mercilessly no matter which of them rode, and were finally driven to carrying the ass and even then gave no satisfaction to their many critics.

It is a contractor's place to make money, and no one ought to grudge him this. Engineers too often appear to think it their place to see to it that their job shall cost the contractor all he gets for it. On the other hand, unless some hold is kept on a contractor, there is a tendency to reduce scantlings that finally reduces things to rubbish. There is also a natural incentive to cheapness which should not be allowed to outrun reason. It has required many years of unremitting care, study and attention to raise English boiler-making to its present high level. Materials, methods, working results have all been made the subject of close investigation, but the improvements have come from outside the ranks of the makers. They have come from the inspecting societies, and only in the second place from the boiler-makers, as a rule, and then only because of competition in working up to the demands of the inspectors. Yet even at this late hour with pressures of 200 pounds per square inch on large shell boilers, there are makers who will request to use materials that have no business near a modern boiler. There is one material, a sort of malleable or toughened cast iron or alloy of iron and steel, that has been used for steam pipes and has been even made into mounting blocks. It is an uncertain material, of variable toughness and little or no ductility, and thus not safe. If it were not for the inspection societies this material would be quite common in a sense different from its now common nature.

Contractors and manufacturers have also a bad habit of calling things by wrong names. Things are advertised as gunmetal. Now by gunmetal I understand an alloy of copper and tin, but the gunmetal supplied by many manufacturers, all the way from Berlin to San Francisco, is largely spelt with the letter "z." If yellow brass is good enough for the articles, why advertise them as gunmetal and tell unnecessary lies? Lodge a complaint with a manufacturer who advertises one article when he means another, and he is ready with an answer: The material he uses is better for the purpose. Why, then, conceal its superiority? Simply that he either does not believe himself or has not the courage of his convictions.

London.

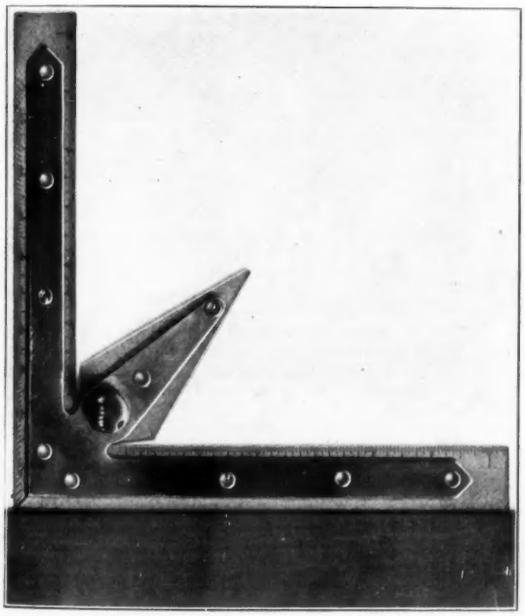


FIG. 1.

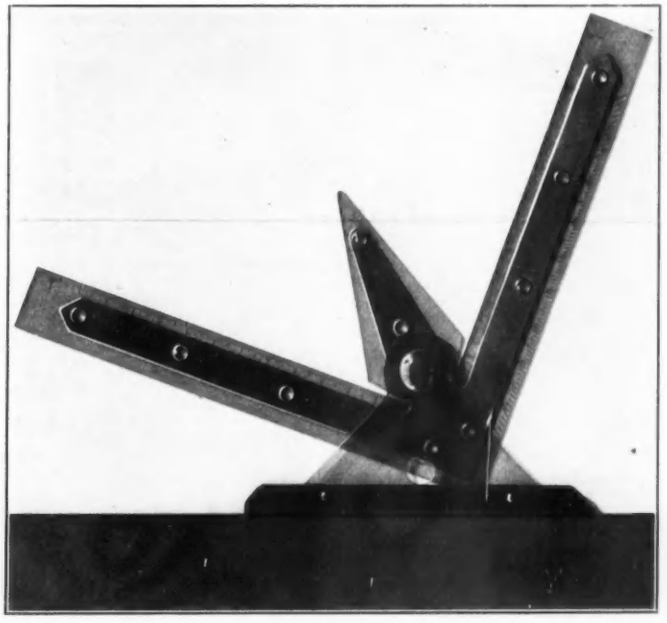


FIG. 2.

DRAFTSMAN'S UNIVERSAL ANGLE.

Draftsman's Universal Angle.

Mr. D. J. Kelsey, of 85 Cottage street, New Haven, Conn., who has brought out various instruments for draftsmen's use in the past, sends us his latest instrument, which we illustrate herewith.

When used as shown in Fig. 1, it is a simple set-square, with the addition of interior short edges for ruling the outlines of the ever-recurring hexagonal bolt-head, etc.

When the base shown in Fig. 2 is attached, the instrument may be used for drawing any angle measured from either the vertical or horizontal. Either edge of the legs may be used, thus taking advantage of the light as it happens to fall. The outside edge of one leg is graduated in degrees, the center of the protractor being marked by a cross on the centerpiece. To adjust the instrument for any angle, its base is placed against the T-square and the center mark is brought to some horizontal or vertical center line on the drawing, when the instrument is swung about the pivot until the proper graduation line is brought to the same center line.

The instrument is of transparent celluloid, riveted to a light stiffening back of aluminoid. The inside edges of the legs are graduated in inches and sixteenths. All graduations are upon the under side, and are filled with a red coloring matter that makes them plainly visible when laid upon white paper. The instrument is a handsome one, and ought to prove useful.

A Ballot on Weekly Time Schedules.

As an illustration of the growing spirit of consulting employees in matters which concern them chiefly, we are glad to refer to a recent action of the H. W. Caldwell & Son Company, of Chicago, in determining the weekly time schedule for their works. Having decided on adopting a fifty seven-hour week, the company posted a notice to this effect, with a statement that they had no preference as to how the time should be made up. Each employee was given a printed ballot, reproduced herewith, on which four schedules had been made out, with the request that he in-

dicate his preference on the ballot and deposit it in a box provided for that purpose. Our readers will be interested to know that a great majority of the men expressed themselves as in favor of the Saturday half-holiday plan, and the shop will accordingly be run on the schedule marked No. 3 on the ballot.

EMPLOYEE'S NUMBER.....

No. 1	7:30 to 12:00 12:30 to 5:30	Every day
No. 2	7:00 to 12:00 12:30 to 5:00	Every day
No. 3	7:00 to 12:00 12:30 to 5:45 7:00 to 12:45	Every day except Saturday — Saturday
No. 4	7:00 to 12:00 12:45 to 5:30 7:00 to 12:00 12:45 to 4:00	Every day except Saturday Saturday

BALLOT FOR TIME SCHEDULE.

tool steel were then made, hardened and let in. The lid *B* also of cast-iron was then made and milled out at one end to hinge on *A*. A hole was drilled through both and the pin *D* let in tight in *B* and to work free in *A*. Lugs *E* and *F* having been cast on *A* and *B* respectively, for the eccentric clamp-latch *H*, they were milled through and piece *G* got out and fastened with the pin through it and through the two lugs *A* so as to swing free. The handle H was then made and worked out, drilled and fastened, swinging on *G* by the pin through the center. Two holes were drilled and tapped at each side for the set screws *I*, which had been made and equipped with jam nuts as shown. A center was then struck from the stud *C* on to the lid *B* and all the holes laid out from that. They were drilled through the lid *A* with a very small drill and enlarged for the bushings, which were then made, hardened and ground and driven in. The work was then inserted within the jig, as shown, the ¼ inch steel. This was then removed and clamped to the lid *B*, Fig. 2, and the holes were spotted off and centered, after which a small drill was used and run straight through. I have found this plan of using a small drill first very reliable, the small hole drilled first, acting as a center and guide for the larger drill all the way through, and the holes so drilled invariably prove correct. It was also quicker than the way used by a large number of toolmakers of prick-punching and drawing circles.

Fig. 3 shows a casting, also of aluminum, and used as a brush holder bracket. All that was done to this before drilling was to bore out and ream the center hole, which was for centering it when in position on the upper bearing. The holes were drilled in the jig shown in Fig. 4. The holes at each end were for the brush holder posts and were equidistant from the center. The other four holes had to interchange to give the brushes a quarter of

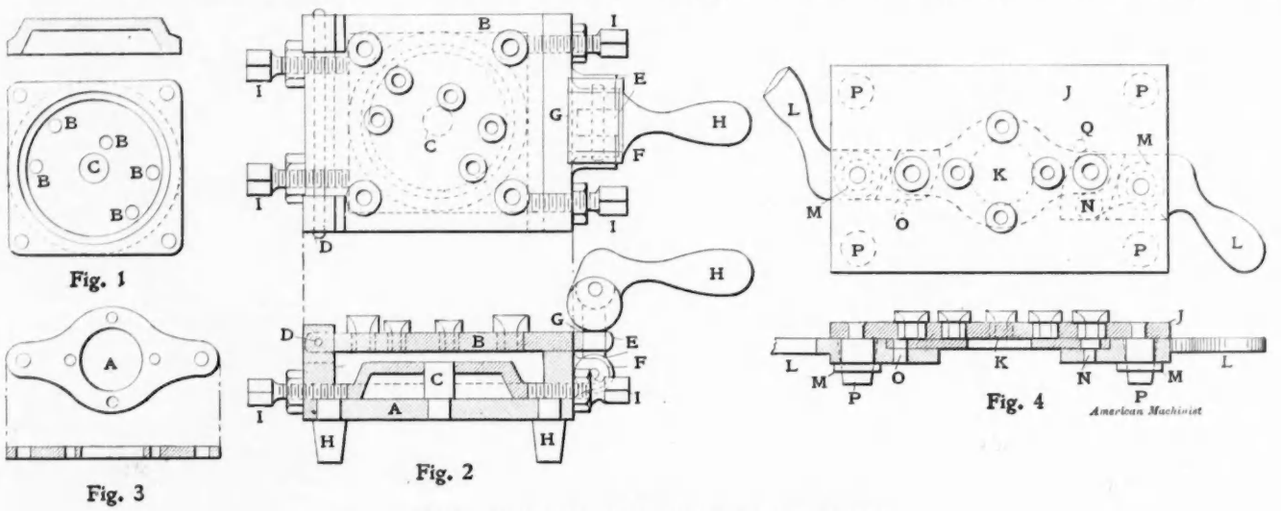


Fig. 1 Fig. 2 Fig. 3 Fig. 4

JIGS FOR MOTOR CASE AND BRUSH HOLDER BRACKET.

Tools for Interchangeable Work—V.

BY JOSEPH V. WOODWORTH.

JIGS FOR MOTOR CASE AND BRUSH HOLDER BRACKET.

Fig. 1 shows an aluminum casting which served as a motor case for the cloth cutter. This casting, like the rest, was machined all over to a uniform size, by first chucking and boring the hole *C*, which was a clearance hole for the motor shaft. It was then turned on an arbor, faced both front and back and then milled on the four sides; the other nine holes were then drilled in the jig shown in Fig. 2. The four corner holes were all an equal distance from the center and the same distance apart, so as to interchange, and were for fastening the four studs which support the upper bearing bracket. The other five holes *B* were for fastening the case to the standard described in No. 4.

The jig is combined of a casting A, milled all over, and a steel stud *C*, let into the center of the bottom and just fitting the hole *C* in Fig. 1. The four legs *H* of and the four set screws adjusted until the work was in exactly the proper position; that is, so that it would fit between them when on the stud *C* without any side motion. The jam nuts were then tightened and the points of the screws, which had been slightly tapered and hardened, acted as permanent locating points for the work.

In operation, the eccentric latch *H* was swung back until clear of lid *B*, which was swung clear of *A* and the work placed within; the lid was then closed, latch *H* was swung out on to it, when by pulling up on *H* it was locked securely by the eccentric; all the holes were then drilled, the work removed, another piece inserted and so on. In locating the holes *B*, Fig. 1 in the lid, of course care had to be taken to get them in the proper positions, but we managed to do it by a very simple and reliable means. A piece of machine steel ¼ inch thick, and made wide enough and long enough to take in the five holes, was inserted within the jig and the holes to be duplicated transferred from it through a turn. *J* Fig. 4 was a rectangular piece of 3-16 inch flat cold rolled steel. A disk *K* of the same material was then turned to just fit the center hole *A* in the work, Fig. 3 and fastened by rivets to the plate *J*. One of the castings was laid out and the holes drilled. It was then laid in the back of the plate *J* centering itself on the disk *K* and when in the right position, as shown in the top view Fig. 4, the hole for the stop pin *Q* was drilled and the pin driven in. Four legs *P* were made and hardened and let into the corners of the plate. The two clamping levers *L L* of cold rolled steel were made to swing on central studs; that is, they were made to lie up against the bottom of the plate, fitting between it and the heads of the shoulder screws *M M* and cut away for say one-half the thickness and half way from the end as shown by the dotted lines and also in the cross section below. In the right hand one is shown the pin *N* for forcing the work against the stop pin *Q*. At the left the pin *O* is to prevent the lock lever *L* from going too far. After

all this was done the clamping levers *L* were beveled off on the one side, so as to slide on the work freely. The casting that had been drilled was used as a template and the holes transferred through it to the plate *J*, when they were drilled and enlarged as described for the jig, Fig 2. The bushings, hardened and ground, were driven in, the pin *N* was filed away so that when the work was forced up against the stop pin *O* the lever *L* would be on the center; the pin *O* was filed also to allow of the other lever assuming the same position. Holes were drilled through the end bushings and then enlarged in the levers for clearance holes for the drill.

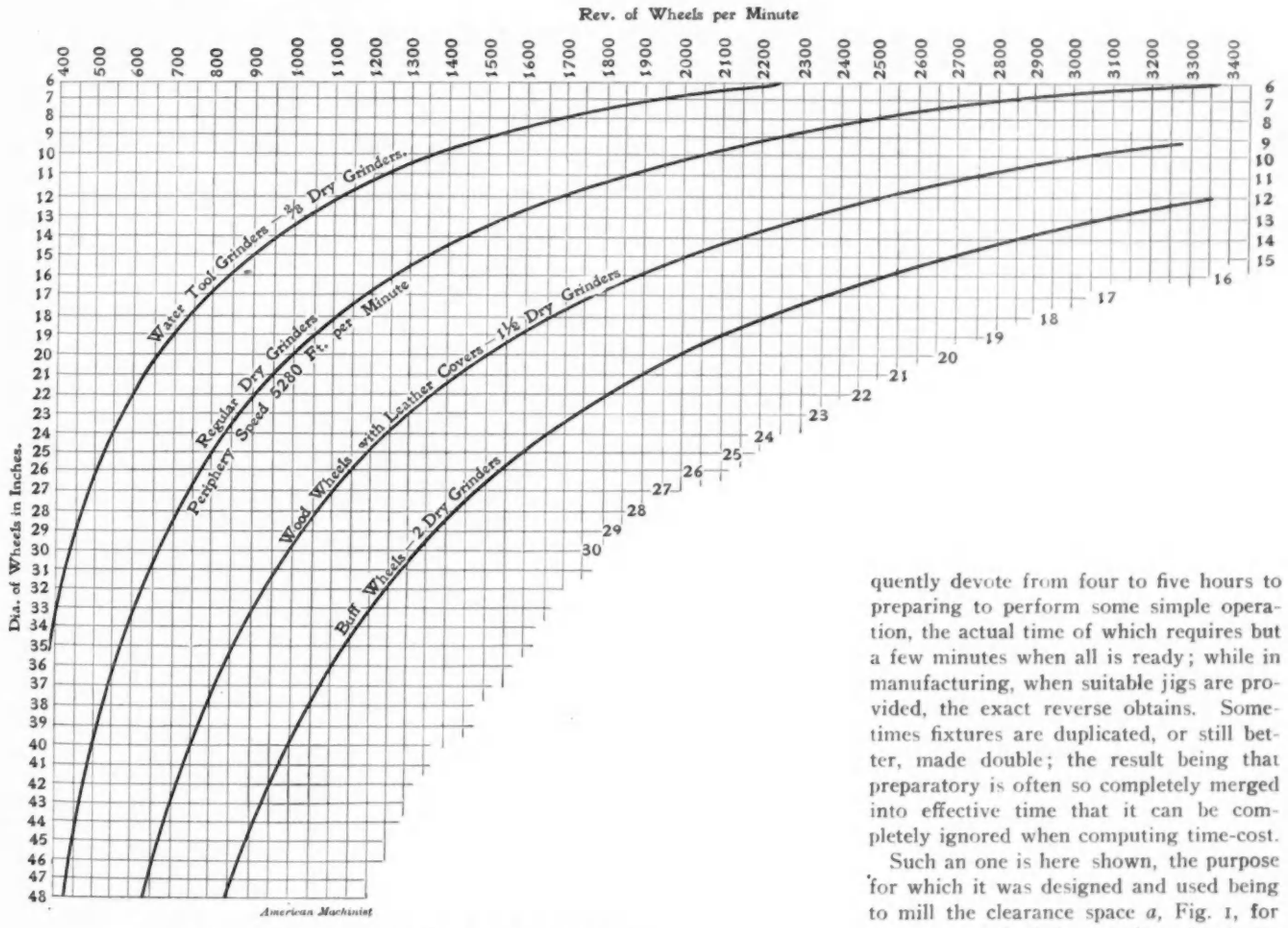
The jig being then complete it was turned upside down, the work was placed on the disk *K*, the right hand lever brought around until the work was forced against the pin *Q* and held snugly between the plates *J* and the lever, the other lever likewise stopping against pin *O*. The jig was turned over and resting on the four legs *P*, the holes were all drilled. This jig proved all right for quick handling and accurate work.

A great electric firm of Berlin has been awarded at the Paris Exposition twelve grand prizes, eleven gold, twenty-one silver and seven bronze medals—all of which it will have to pay for before delivery.

Speeds of Grinding and Polishing Wheels.

By the courtesy of the Builders' Iron Foundry, of Providence, R. I., we are enabled to present the accompanying diagram for the speed of emery grinding and polishing wheels. By simply tracing horizontally from the diameter of the wheel to the curve representing its character and then vertically, the number of revolutions per minute will be obtained.

Of course those of our readers who are posted in the fine points of grinding will not place too great reliance upon hard and fast rules of this kind, as factors which cannot be formulated enter the problem and modify to a certain extent the speed necessary for the most effective results. Where grinding machines are employed in the regular process of manufacture, the material operated upon and the hardness of the wheel itself must be considered in determining the speed if the best results are to be secured, but for grinders employed in general shop service, such considerations can scarcely receive attention and for such cases the diagram will be found to be a sufficient and very convenient guide, while for all cases it will serve to establish average and approximate speeds.


Rev. of Wheels per Minute
Dia. of Wheels in Inches.
Water Tool Grinders—⅜ Dry Grinders.
Regular Dry Grinders
Periphery Speed 5280 Ft. per Minute
Wood Wheels with Leather Covers—1½ Dry Grinders
Buff Wheels—2 Dry Grinders
American Machinist

SPEEDS OF GRINDING AND POLISHING WHEELS.

Designing Small Tools and Fixtures —A Milling Fixture.

BY A. B. CHRISTMAN.

Perhaps the most important consideration in designing small tools and fixtures is, that their construction be of such a nature as to permit of operating them with the least possible exertion and number of movements of the operator.

Every superfluous movement, such as cleaning surfaces, unnecessary clamping, alining, squaring, measuring, etc., adds to "preparatory" and subtracts from "effective" time. As showing the difference, toolmakers and job-shop workers frequently devote from four to five hours to preparing to perform some simple operation, the actual time of which requires but a few minutes when all is ready; while in manufacturing, when suitable jigs are provided, the exact reverse obtains. Sometimes fixtures are duplicated, or still better, made double; the result being that preparatory is often so completely merged into effective time that it can be completely ignored when computing time-cost.

Such an one is here shown, the purpose for which it was designed and used being to mill the clearance space *a*, Fig. 1, for the emery wheel in cast-iron hand-rest for a tool grinder which we make in lots of 100; the time required being seventeen hours when milled in the regular milling-machine vise.

As slot (clearance space) is 13-16 inch long, and cutter 3½ inches diameter, revolving 35 turns per minute and the table feed is .024 inch per revolution (a slow feed for cast iron), effective time, plus a liberal allowance for adjusting the cutter, arbor and vise in the machine, should not be over five hours, showing that we were losing more than 70 per cent. of the full effectiveness of the machine.

In Figs. 2 and 3, *A* represents work in position on *B*, being adjusted to bear against and centered by four hardened position pins, and held in place by means

of bolt *D* extending from the slot in the platen *P* through *B* and clamp *C*. *E* represents the cutter on arbor *F*; *G* is the tongue to fit the groove in the platen.

Figs. 4 and 5 show cross-sections through B at *b*—*c* and *d*—*e* respectively. With this construction of *B*, which was secured entirely in the pattern, and small bearing surfaces on which work rests, chips readily slide to table out of the way.

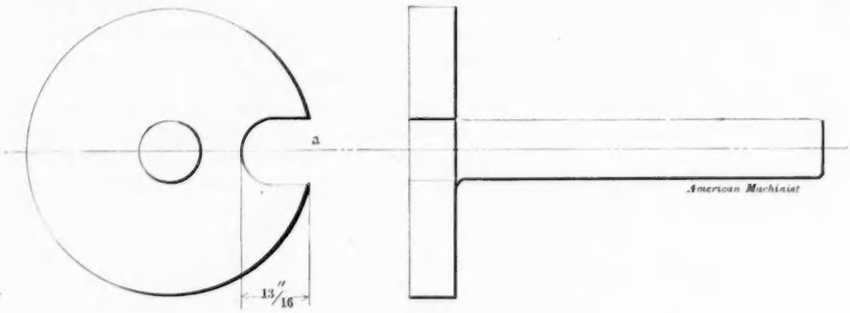


Fig. 1

THE PIECE OF WORK TO BE MILLED.

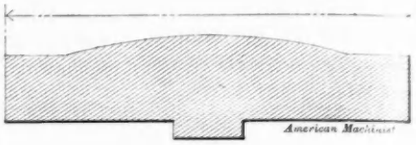


Fig. 4

SECTION OF MILLING FIXTURE AT CENTER.

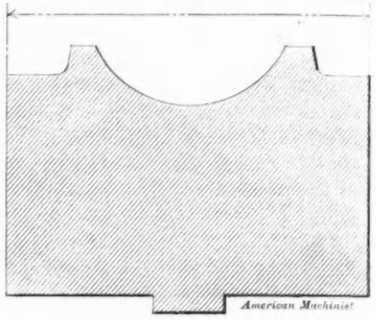


Fig. 5

SECTION OF MILLING FIXTURE NEAR ONE END.

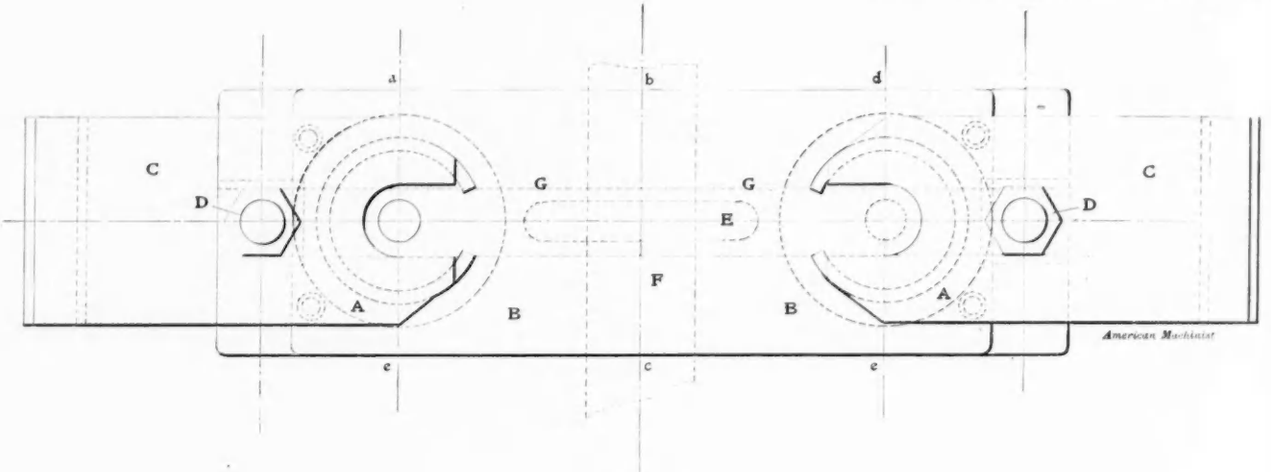


Fig. 2

PLAN VIEW OF MILLING FIXTURE.

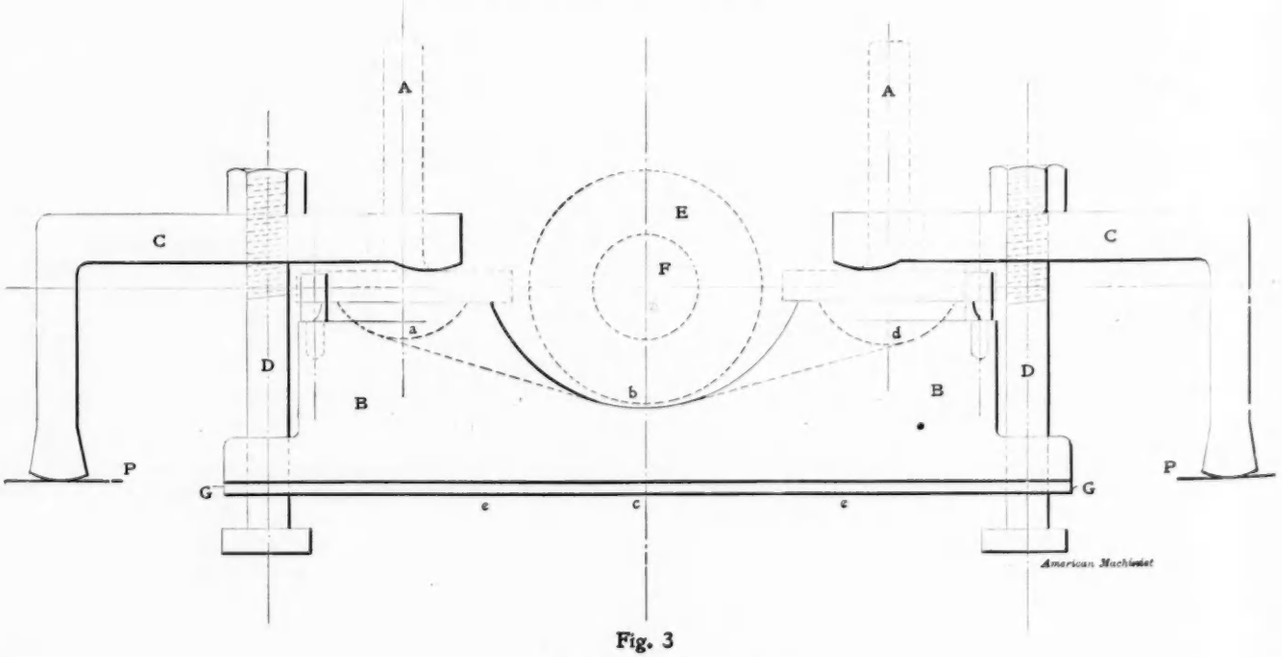


Fig. 3

SIDE VIEW OF MILLING FIXTURE.

It was thought best to have bolts pass through holes in *B*, instead of having open-ended slots, to prevent losing when not in use.

The machine feeds both ways, and while one piece is being milled, the one previously milled is removed from the fixture and another one clamped in its place; so that the machine has very little chance for loafing, but is kept steadily at work.

Letters from Practical Men

The Convenient Draftsman.

Editor American Machinist:

In glancing over some of the late issues of the "American Machinist," I notice the draftsman comes in for much discussion. He is criticised, praised and generally pulled back and forth for better or worse as the writer's special case may call for. I notice in issue No. 26 the article by W. L. Miggett, "A Community Draftsman," which brings to mind a bit of draftsman experience, which no doubt will be of interest to your readers.

It was in the "booming" days of bicycle making, some years ago, before the big firms consumed the little fellows and $100 to $135 was only a fair price for a wheel.

A draftsman (James) cast his lot with one of the smaller concerns which had started up a year or two before, making 150 or 175 bicycles per year, and were branching out, straining themselves at this time to turn out 3,000 machines for the season's work; which seemed an enormous number with the facilities at hand. A working drawing was an unknown luxury in this shop. Sketches on letter heads or brown wrapping paper seemed to pass all right, until one day Mr. W—— the president, general manager and superintendent combined, came into the tool room with a rush, saying that, "a tandem must be made at once for the coming cycle show at Chicago. A drawing must be made. He intended to have something to swear by instead of 'at.'" James was directed to stop on that crank bracket jig, "wash up" and start at once on the design. First to take a rule with him, go over to town and to the Columbia Bicycle store, measure the total length of their tandem and have our carpenter get a drawing board into shape large enough to lay out a tandem full size. Before completing that drawing it was found necessary to fit up a drawing table, blueprint room, including printing frame, pans, water pipes, etc., which all devolved upon James, everyone else being too busy to give any assistance. After finally completing the drawings of two models of tandems, it was deemed best to make others of the standard machines, then tool drawings were called for, and later a new adjustable handle-bar, and a frame-building jig, spoke-heading machine, etc., until drawings commenced to get quite numerous about the shop. Suddenly the rush ended for that season and the draftsman was assigned to the duty of numbering all the machine tools with white paint, after which the manufacturer evolved the happy idea of having the draftsman paint a sign of the firm's name on the outside of the building in letters 18 inches high, which, when completed, was cruelly criticised by some of the draftsman's acquaintances. Next came the design and arrangement of a catalog for the next season, which included photographing, sketching, sectional drawings of hubs, crank-axle bracket, etc., and writing. This was followed by the opening of a local salesroom in the city. Again the convenient draftsman must lay out the floor space, design a bicycle stand for exhibiting the wheel to advantage, and later, to arrange the "parts" for the "mechanical" table, which included sawing up frames, polishing cones and cases then drawing the color to a beautiful "dark straw"—to prove that the bearings were of tool steel (?), also rigging up a test to show our "never wear," "unbreakable" chain. When this last choice morsel of experience had past came the designing of new enameling tanks and drying ovens to replace the old ones, which were finally completed with the assistance of the foreman of the enameling department, who, by the way, had forgotten a great many things that he thought he knew all about.

The foreman of the assembling department left the firm about this time to take a better position, when the convenient draftsman was once more called into use to fill the vacancy until a better man could be secured. Two years' work was finally ended by our convenient draftsman, at the New York Cycle Show, where he was expounding the good qualities of the X & Z special roadster, on the floor space occupied by his employers.

During this time James considered himself a much overworked man, but many times since it has occurred to him that the endless variety of experience of those two years was as valuable to him as a course of training in a technical college, perhaps even more so.

MAC.

Our Skill Supply.

Editor American Machinist:

I have some things on my mind that have been working for a considerable time, and they have got now to where they keep poking me to say something about them. I have some hesitation about doing this, because some of the things that I feel impelled to speak of, say disrespectfully, are backed by the best intentions of some of the best men in the world, men whom I profoundly respect and sincerely admire. I have the weakness that we all are slaves to, for making inordinate concessions to good intentions, even when we know that they are flavored more with folly than with wisdom. There are things that should be heavily sat down upon, but which are not, because they are so evidently well meant. and so it results that much work that might have been good work is worse than wasted.

When dealing with things strictly mechanical I usually have not much hesitation about saying that a thing will not work, if that is my ultimate opinion of it, or of saying that it might work better some other way, if I am pretty sure that I see a better way. But when it comes to matters related to education, and to the large and slow movements of national industrial development, I do not feel as free to talk or as confident to assert; and yet, when my convictions are as pronounced upon these topics as upon the others, I do not know why I should not as freely express them.

While there has thus far been much talk upon the subjects here alluded to, it can scarcely be said that there has been much discussion of them, as there has been such a uniformity of sing-song to the utterances, and it may be my duty to do what I can toward presenting a possible other side for consideration.

I am not aware that anyone has yet remarked what a curious state of affairs now exists in the United States among those who are seeking the best interests of the producing classes. We have at last, and only lately, taken our measure as manufacturers in comparison with the other and older peoples of the earth. We find that our stature is as high and our standing is as firm as that of any other nation. In large fields of production and in innumerable details of manufacture we are superior to all others. There are vast numbers of things that all the world wants, which we can make cheaper and better than anybody else. We realize that we need nevermore feel afraid of any foreign competition. We determine, in fact, that foreign competition is just the thing that we will hereafter be seeking, because wherever competition can be found there will be industrial victories to be won. We not unnaturally exult as we for the first time fully realize our commanding position. If under the circumstances we are dispo ed to crow and flap our wings, we need not feel ashamed of it, either now or later.

And now the funny part begins. Right in the midst of our well-warranted self-gratulation, when our workers are most numerous, most skilful, most successful, we are told that skill is dying out, that skilled workers are becoming scarce, that soon, as things are going, we will be left in the lurch by the lack of both competent operatives and of the higher skill and reliability that are to exercise supervision and direction. The cry is raised and reiterated that something will have to be done, and done soon, to secure a constant and reliable succession of workers such as we now have, and better.

Professional educators are, as my obser-

vation suggests to me, much more exercised over the assumed exigencies of the situation than shop proprietors are. Of course in the extreme fluctuations of business, which are one of our greatest evils, there come times when everybody is busy, and then of course there will be found shop foremen and superintendents who will complain a little about the difficulty of finding at once the right men for every job, but surely no one wants, in the times that are not so booming, to have a lot of skilled men standing idle because no man can find a place for them, and when the slack times come the same foremen and superintendents want as little as possible of that toughest of all jobs, the telling of good men that there is nothing for them to do. While the demand for skilled labor fluctuates so widely, there being sometimes double as many workers required as at others, the periods of depression often extending over considerable periods of time, it should not be expected that the full supply for the greater demand can be always and instantly ready. So far as the demand is constant and reliable, the supply is not likely to be inadequate.

I have in a casual way looked into this somewhat in detail. I have had it on my mind and have been in the habit of asking in the various shops that I have looked into from time to time about the matter of securing satisfactory help. I have very generally been assured that there is no such difficulty as is assumed by the professional educators and their coadjutor philanthropists to exist. Especially in the many isolated manufacturing establishments which are scattered through the various towns of New England and elsewhere, the one concern being usually the dominating interest of the place, they have no difficulty in keeping filled up with excellent workers from the young men as they emerge from the top of the local schools.

As to the supply of foremen and superintendents there is other evidence that is more certainly conclusive. They evidently are not in such demand as some would have us believe, because their market value has not advanced as it should. If we wanted so badly either to hold them or to get them, we would be paying them more. Consider the value and importance of the services of a good foreman or a good superintendent, especially as evidenced in the difference between a good one and a bad one, and then consider the salary and incidental inducements that are offered to hold them in that line for a life work, and they can't be wanted so much after all. Pay them better and there will not be so many of them leaking out over the top into other and more remunerative and more satisfactory occupations.

The trade of the machinist is peculiar in that it is a preparation for so many positions outside of it. It takes a man of good natural ability and of considerable education—not always from books—to make a first-class machinist, and more of the same to make a competent foreman or a high-toned superintendent; so that when he is well qualified for these positions he is also well prepared for many other jobs with which the machine shop apparently has little to do; and many of these keep calling him, and many of him respond to the call, and so they climb out over the top continually. Pay him better to stay in and he will stay longer. So also, provide steady work for the men of the lathe and the planer and the vise, and there is not likely to be a scarcity of them. The fluctuations of trade for which politics and stock gambling and wars and rumors of wars are to blame are necessarily inimical to steady work and sturdy and skilful workers.

I have here said only a word or two of my estimate of the assumption of the scarcity of skill which is the basis of the modern schemes of technical education, but I have run over the space limit to which I wish to confine myself.

TECUMSEH SWIFT.

Built-up or Welded-up Die Work.

Editor American Machinist:

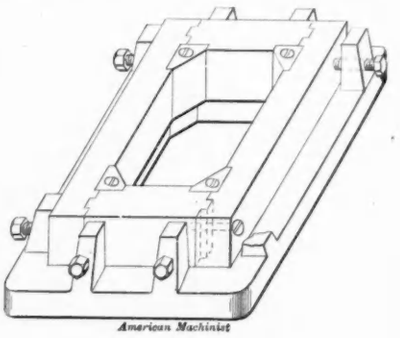
A question that is often asked me by those about to make a lot of dies is this: "Shall we make them of solid steel, and if so what kind, and how can we get them forged so as to save stock and labor?"

My experience has been this: If you have got a smith who knows his business and can do a good job, weld them up; but I have never yet found but one or two shops that could do this trick and be sure how it was coming out. I am well aware that there are two or three firms in the business who can take, say a 12-inch round die, and weld up the steel ring and weld the same on to a wrought iron plate, and be sure of good results before it leaves the smith's hands, and they can do this every day in the week. If I had a man like that, I would never make another built-up die; but one doesn't find such a man on the corner waiting for a job; he has one already.

At one time I had a lot of dies, six, I think, to make, all square ones, and failing to get good results from the smith, I ordered six blocks from the mill; they were 12x14x2 inches thick, one-half steel and one-half iron. They came in course of time (about sixty days, I believe), and they looked nice. I started three of them; cut out the dies and hardened two of them all right; but the third one parted in the weld, so it was useless. Well, I fitted the punches to the other two and started them to work. By the way, did you ever think it was a great deal better to make a die for your own use than for somebody else to use? It seems to work better, and a complaint from the boss of the press room doesn't sound so big as one that comes in a letter—especially if it is a typewritten one.

Well, the dies worked very well until they were worn down to ¼ inch of steel, then one of them began to "peel," as the press-boy called it. The vibrations caused by the punches started the weld at one end of the die, and it kept "peeling" until it was two-thirds of the way across and we had to scrap it. The rest of the blanks I had planed up and let the boys have them for bench blocks. They were a little expensive, but they made good ones.

There was one fault with these dies that is common to all welded dies, except round ones; that is, the impossibility of making a perfectly square blank, and the enlarging of the blank caused by the clearance given the die. To overcome this, we finally made a die like the sketch, the sides and ends of separate pieces, and the corners dovetailed in. All the pieces were got out on the shaper, drilled and tapered for the holding-down bolts (not shown), then hardened and ground to an exact fit, then set in the cast-iron bed



A BUILT-UP DIE.

and held in place by the set-screws shown. The cost of the die was about the same as for a solid die, as I could use cheaper labor for most of the work, but as it did about double the amount of work done by a solid one, and the work was far better. I called it a cheap die, and we made the rest in the same manner.

Now, I take this view of the matter; if I had a smith who could weld up a 12 or 24 inch ring on a wrought iron plate, and be sure of his work I think it would be cheaper and better to do so, but rather than take chances of a second-class man, I build them of steel rings set in cast-iron blocks. Of course, in some cases, the cost of the steel should be taken into account, but when the work in the smithy costs eighty cents per hour, and the steel seventeen cents per pound, it doesn't seem to me that the cost of the steel cuts much ice anyway.

All the punches were made solid and left soft, which I think is the best way for thin stock.

Now, as the small boy said, "I don't know it all, but I wish I did," and I would like to hear from the rest of the class.

J. L. LUCAS, I. G.

An Antique Drill Press in an Antique Shop.

Editor American Machinist:

A few days ago I noticed in a country paper that a half interest in a certain machine shop was for sale. The advertiser went on to cite the advantages of the place, the goodwill of the people, the great amount of work in command of the shop, and so on; in fact, one would think it was an ideal place, and would wonder if the advertiser was getting old and had no posterity, or how it was that such a thing was offered to the general public.

As I read the advertisement a picture came into my mind, and it was all that I needed to satisfactorily answer the above, and I think others can find some interest in the contemplation. It happened that about two years ago I was in the vicinity of the shop, and made it a point to visit the place, expecting to see some antiques, but I was wholly unprepared for what I found, and the accompanying sketch will reveal what struck me hardest. This was the principal drill press in the shop, and it was operated by a young man of promise, judging from his appearance. I do not remember what the job in hand was, but I distinctly remember the "fixtures" he had for doing it. As shown, the drill was bolted to a post and had no table, the lack of which was made up for by an assortment of dry-goods boxes of varying sizes and conditions, which were used to block the work up to the drill, which was some 4 feet above the floor, the work being held by the hands. There was a limited travel to the drill spindle, which was operated by the foot by the method shown; there being a lever running along the floor and a connecting piece going up to a lever overhead, which was attached to the drill spindle. The drilling was done with flat drills.

In talking with the man, I learned that he had never seen a modern drill press, but he had "heard said that there is a drill that has a table that one can raise and lower according to the work," and that "had power feed to the drill spindle;" but he gave me the impression that he had never seen even a picture of one. The whole shop was on about the plan that this machine would suggest. Some of the tools were a little more modern, but at the time I visited the works I asked myself how a concern could do business with those tools and methods.

I learned that they had recently cut down wages. The young man on the drill was getting the whole of 80 cents a day, and the best men were paid about $1.50 per day. Now, this shop is within twenty-five miles of modern machine shops doing a manufacturing business, paying fair wages and using the best of methods, and how a shop such as the one in question can keep its men, especially the young ones, under conditions named is more than I can see.

You will notice from the sketch the heating and ventilating system, the heating being done by burning 4-foot wood in a box stove, and plenty of ventilation being supplied through the broken window lights. The floor was so strewn with strap iron, work and tools that it was difficult to pick one's way about the room, all being thrown together without discrimination.

Now, if any of the readers of the "American Machinist" have money which they would like to invest (?) in such a shop—and, according to the advertisement, "no better opportunity can be found"—I would favor them by putting them in communication with the proprietor.

Pittsfield, Mass. CHAS. C. ABBOTT.

Long and Short Crane Hooks.

Editor American Machinist:

"Some things that are better not done," by Professor Sweet, in your issue No 36, is very good. In a great many cases there is no absolute necessity for running the end of a crane hook up in the way it is

"FOR SALE."

commonly made, and in many cases where hooks are used it is a big improvement to chop the end off, but, on the other hand, there are times where one needs even more room on the hook than is given. The crane builder or hook maker has perhaps fallen into a rut, but the beaten track is easy to follow. On tackle blocks this long nose to the hook has good reason, as they have to be "moused" or lashed to stay in some places, particularly in marine work. It would probably take some time to educate people up to the sawed-off style of hook. A. D. WILLIAMS.

Some Cheap Core Boxes.

Editor American Machinist:

Here are some more core boxes as we make them in "Hoboville."

Fig. 1 represents the part to be cored, which is the bearing of one of our standard machines.

Fig. 2 shows the pattern. It is made to mold print down. There is a facing piece on each end of the bearing. They are made to leave their own core, being skewered to the pattern and picked in after it is drawn.

Fig. 3 is the core-box for coring the bearing. I have drawn one of the loose pieces away from the box to better show its construction, which is simple and can easily be understood from the sketch. It is a skeleton box, a strickle being used to strike off the round part; the loose pieces are then drawn away and the box lifted from the core.

Fig. 4 shows how we make a skeleton box for a straight, half-round core. Three staves screwed to two half-round heads. This is a "hurry up" job, to be used but once.

Fig. 5 shows the same box made for a standard or permanent job. In this case the heads are made as shown, and glued and screwed to the staves with good long screws. "HOBO."

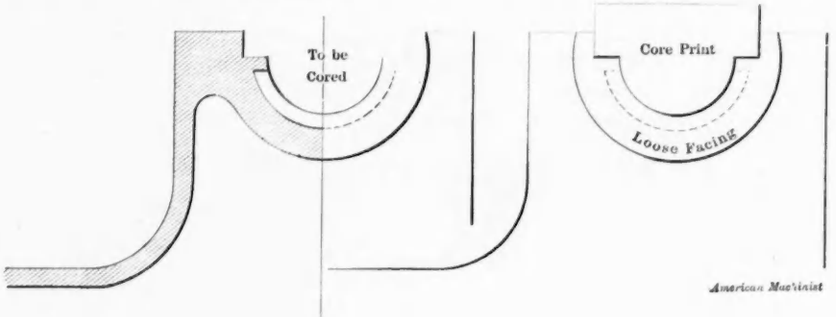


Fig. 1 THE PIECE TO BE MADE.

Fig. 2 THE PATTERN.

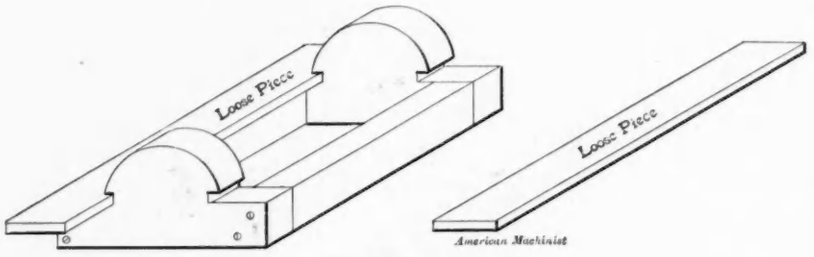


Fig. 3 THE CORE BOX.

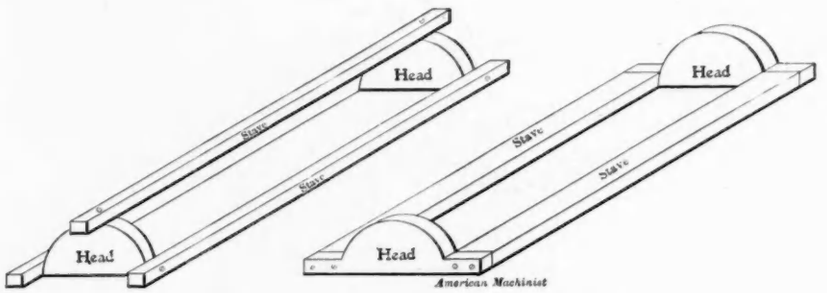


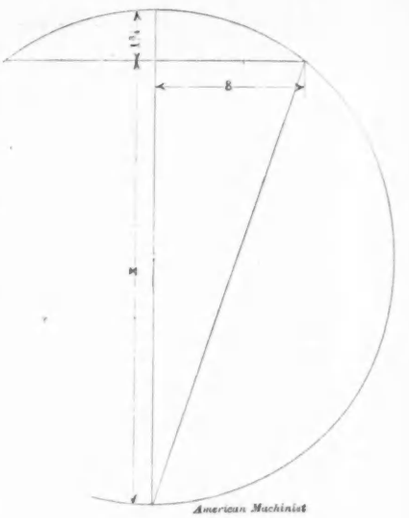
Fig. 4 A TEMPORARY SKELETON CORE BOX.

Fig. 5 A PERMANENT SKELETON CORE BOX.

Finding the Radius.

Editor American Machinist:

I don't think Mr. G. R. Easy, whose letter you publish in issue No. 37, has improved on my way of "finding the radius" at all. If he objects to the algebra, I can make it much simpler for him by working the example by proportion, thus:



FINDING THE RADIUS.

$$1\tfrac{3}{4} : 8 :: 8 : x$$

$$x = \frac{8 \times 8}{1\frac{3}{4}}$$

$$= 36\tfrac{4}{7}$$

$$\text{Diameter} = 36\tfrac{4}{7} + 1\tfrac{3}{4}$$

$$= 38\tfrac{11}{28}$$

$$= 38.3214$$

$$\text{Radius} = \frac{38.3214}{2}$$

$$= 19.1607.$$

B. VOGEL, JR.

Water Tube Boilers.

Editor American Machinist:

I note the letter of Mr. John Richards in your issue No. 38, referring to my Belleville letters and giving some account of Captain Parker's experiments.

The Parker boiler shown in the sketch in many ways resembles the first Herreshoff coil boiler brought out twenty years ago for light-built steamboats. Great numbers were built, and they were very successful when in the hands of friendly men.

The only method known for regulating the amount of the feed water put into the top of the coil (bringing out the steam at the bottom) is by a float in the hot well of an air pump and surface condenser, generally a keel or bilge pipe.

This feed regulation by the hot well fails entirely when we come to try something greater than a single coil in a single boiler.

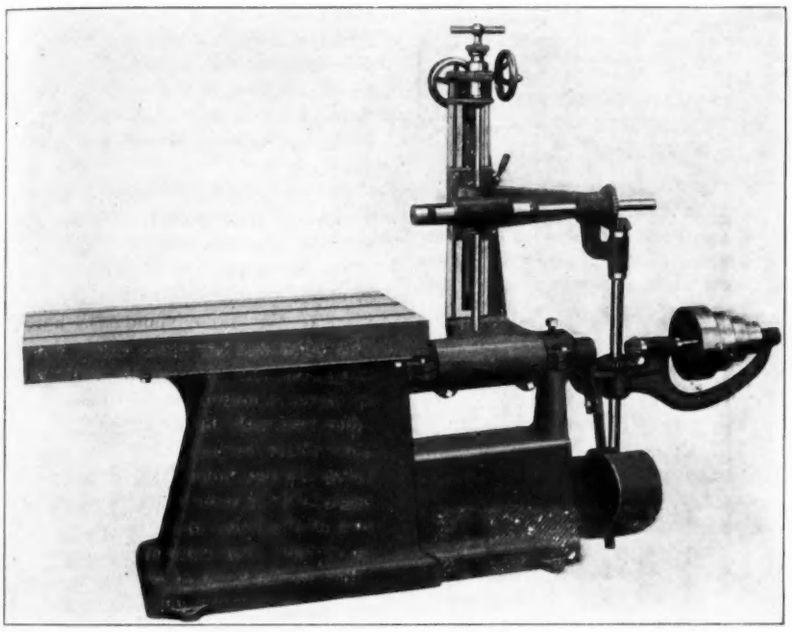
As to copper as a material for the coil, although it was very good in Captain Parker's hydro-carbon flame, I should doubt its lasting qualities over coal containing sulphur, its chemical affinity for the copper being so great.

WILLIAM H. HARRISON.

Braintree, Mass.

A New Horizontal Driller.

We give herewith an illustration of a driller which we think may fairly be called new. This machine is designed particularly for work which, by reason of length, cannot be handled advantageously on either an upright or a radial drill. It is specially adapted for drilling in the ends of long pieces, as, for example, in the end of a column or shaft, and generally for any work within the range of its capacity which cannot be done at all, or with difficulty, on a vertical drilling machine. It is provided with a reversing friction countershaft, adapting the machine for tapping as well as drilling, and is capable of drilling up to 1 inch and tapping up to ¾ inch.



A NEW HORIZONTAL DRILLER.

The manufacturers had need of such a machine in their own work, and finding nothing on the market for just this kind of work, they designed and built this machine for their own use, and it has been found such a useful and satisfactory tool that they have decided to build it for a market machine.

The cut shows very clearly the construction of the machine, and its method of operation can be easily understood. The upright arm swings on journals, which are in line with the cone shaft, and is properly counterweighted as shown. It can be swung in either direction, and moves through 180 degrees of a circle, the spindle being at a radius of 24 inches. The spindle is provided with a hand worm, and also quick-return mechanism and power feed can be arranged if wanted. The distance from the table to center of spindle when the swinging arm is in a vertical position is 17 inches, and when the arm is swung so that the spindle is on a level with the table, the distance from the center of table to center of spindle is 22½ inches. The spindle can be operated at any point through 145 degrees of a circle having a radius of 24 inches. The table is 20x40 inches, and has lateral T-slots, so that work can be held either in jigs or bolted to the table. The spindle is 1 5-16 inches diameter and is fitted with No. 3 Morse taper. It is made by the B. F. Barnes Company, Rockford, Ill.

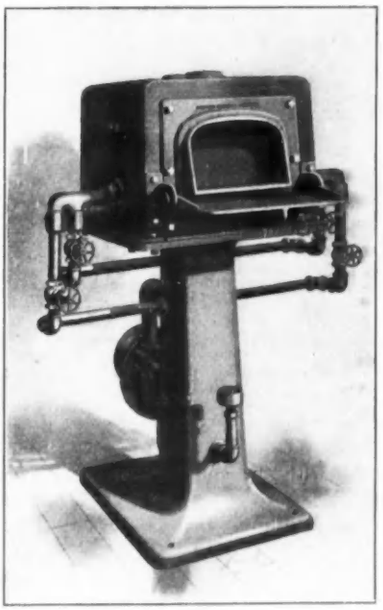
Die Sinking by Electric Current.

An ingenious method of die-sinking has been brought forward by Mr. Joseph Rieder, of Liepzig. The design is molded in relief on a block of plaster of Paris. This block is then placed so that its lower half is immerged in an electrolytic cell containing a solution of chloride of ammonium. This solution rises by capillary attraction to the top of the block on which the design is impressed. The block of steel to be engraved is then laid on the plaster model and a current passed through the cell, the plaster, and the steel. The current can only flow where there is contact between the metal surface and the model, and at these parts dissolution of the metal occurs. As a consequence the high parts of the model tend to bury themselves in the steel, and the process being continued with suitable precautions for a sufficient period of time, a perfect female copy of the plaster model is sunk in the metal plate. It is, of course, necessary to maintain a proper supply of electrolyte to the parts attacked, and to clean the plate being engraved at freqent intervals. An automatic machine has been devised for accomplishing this, and the inventor claims that the method provides a cheap and rapid means of producing dies in most metals. Hardened steel can be wrought by the process as easily as ingot metal.—"Engineering."

Some New Things.

A HARDENING AND TEMPERING FURNACE.

The gas furnace here shown is designed for the use of machinists and others for hardening tools, dies and other articles which require careful and reliable treatment. There is a blower at the back which is to be driven by a small belt and which maintains a constant pressure of about 1 pound of air, the jets adjustably supplied with the air, and gas securing perfect combustion and giving the most steady and uniform heating of the articles to any desired temperature. The blower is of special and simple design, with no springs or gears, running at a slow speed (500 revolutions), delivering the air in ample volume to the reservoir, which is placed under the furnace. The combustion chambers in the furnace are lined with fire-clay tile, and all the joints are faced with fire-clay putty. The linings are so shaped as to give a distributing movement to the flame, insuring absolutely uniform heating all over the enclosed space. The articles to be heated are preferably placed in a muffle, the inside dimensions of which are 12x8x6 inches. The furnace is made by the Chicago Flexible Shaft Company, 158-160 Huron street, Chicago.

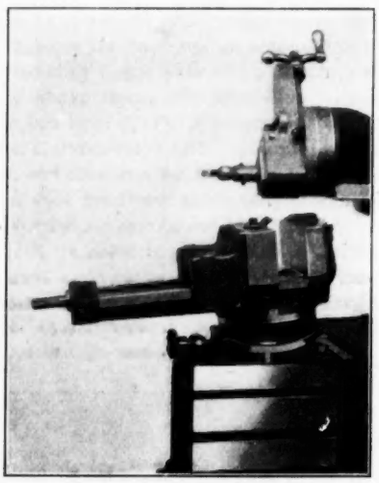


A SELF-CONTAINED GAS FURNACE AND BLOWER.

A CASE HARDENING PROCESS.

The following is the specification of a recently issued United States patent for "a composition for converting iron into steel": "My composition consists of the following ingredients, combined in proportions stated, viz.: albumen, 100 pounds; Epsom salts (magnesium sulfate, $MgSO_4$), 15 pounds. The ingredients have to be well dried, pulverized and mixed. The articles or bars of iron to be converted into steel are put into cast-iron recep-

tacles or retorts of clay in intervals of from ½ to 1½ inches, and the pulverized compound is put between, well packed, and the receptacle is then hermetically closed and subjected to a bright red or white heat in the furnace from eight to twenty-four hours, according to the depth of surface to be carburized, and from twelve to forty-eight hours for complete carburization, according to the dimensions of the iron." The patentee is Erhard Hardmeyer, Kokomo, Indiana.

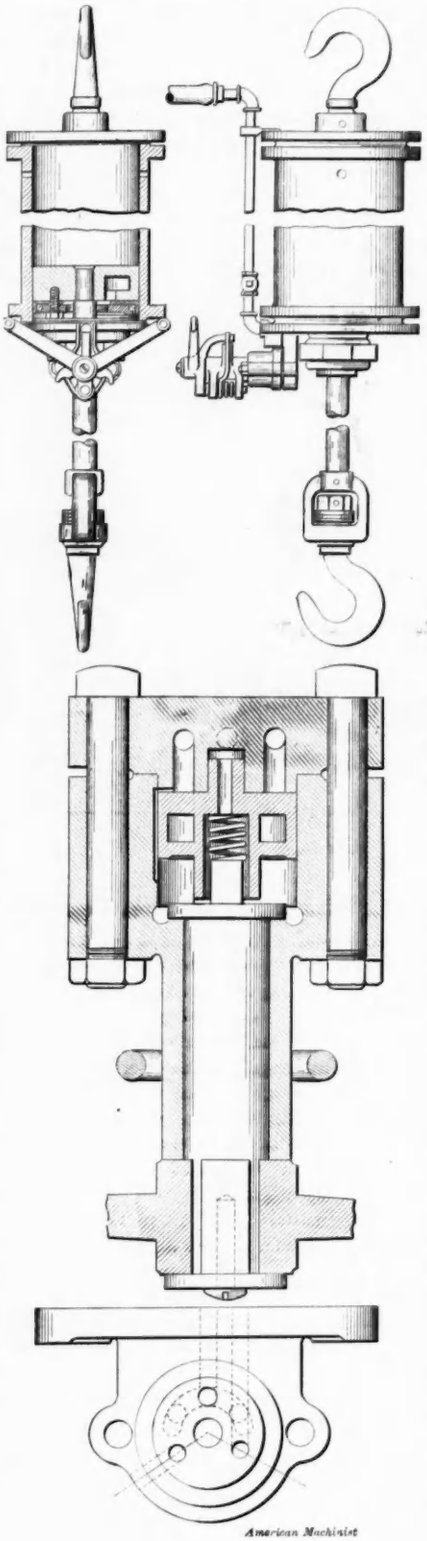


A TILTING SHAPER-VISE.

Gould & Eberhardt, Newark, N. J., have brought out a tilting vise for shapers and other machine tools. The screw at the base adjusts the vise to the required angle, and it is clamped in position by bolts, one of which is seen in the photograph.

SMALL TUBE EXPANDERS.

The inventions embodied in each detail of the modern horseless vehicle are together perhaps not more numerous, ingenious or effective than those which have to do with the construction, adjustment and repair of them. The bicycle factories were filled almost exclusively with special machines, many of which it came in our way to describe as they came out. It must be largely the same with the automobile establishments, although here the turret lathe and the milling machine and similar facilities of the manufacturer of light and intricate machinery, find their fullest employment. Besides the new contrivances that are called for are special adaptations of some that are sufficiently familiar. The steam boiler for the automobile is a nest of small tubes, and the first thought of the old-school mechanic would not unnaturally be that other tools than those of the old boiler-makers would be called for. Many have wondered, for instance, how the small tubes are properly secured. For this work expanders are employed, precisely the same in principle as those used for larger work. The Arthur Company, of this city, are making roller tube expanders which work beautifully upon tubes as small as 5-16 inch in diameter. They must of course be, and are, of the best material and workmanship.



IMPROVED AIR HOIST.

The cut shows an air hoist, the principal interest and novelty attaching to which is in the valve by which the admission and discharge of the air is controlled. The piston, as shown, is cored with three chambers to lighten it, and the follower which holds the usual cup leather packing is secured by three bolts tapped into the solid partitions of the piston. The hoisting pressure being applied only to one side of the piston, the other side has only the atmospheric pressure against it, several holes at the upper or farther end of the cylinder permitting the free passage of the air in either direction. These holes are placed at such a distance from the end of the cylinder that they will be covered by the piston before it reaches the end of the cylinder, thereby enclosing sufficient air to form an effective cushion and prevent the piston from violently striking the head. A check valve in the air-supply pipe prevents the return of any air which has passed it.

For the operating valve a round, flat valve seat with a corresponding valve is provided, the seat being at right angles to the head, or parallel with the axis of the cylinder, so that when the cylinder hangs vertical, the valve spindle is horizontal. The valve seat has three nearly equidistant holes, the one nearest the cylinder being in direct communication with it, and the other two with the air supply and with the atmosphere respectively. The face of the valve has two holes of the same radial distance and the same distance apart as either two of the holes in the valve seat. These holes have free communication with each other in the body of the valve. The normal or inoperative position of the valve is with the holes of its face upon the blank spaces of the valve seat. If then the valve is turned in one direction, say to the right, communication is opened between the air supply and the cylinder, and the piston is driven upward. Turning the valve to the left closes the communication, and the hoisting is stopped. Turning the valve farther in the same direction opens communication between the cylinder and the atmosphere, and the piston and its load are lowered. The construction of the valve permits a large amount of lap, so that slight accidental movements of the valve will not have any effect. The valve is held in its normal position by an outside spring with fingers operating on either side to return it. Stops also are provided, so that the valve will not be moved beyond the wide-open position in either direction. The spindle is separate from the valve, a spring in the inner end of it operating to hold the valve always to its seat and a collar on the spindle against the inner surface of the valve chest, thus forming an air-tight joint without a stuffing-box. When the air pressure is admitted to the chest, this, of course, both holds the valve to its seat and the spindle collar to its bearing. The patentee of the hoist is N. A. Christensen, Milwaukee, Wis.

Industrial Betterment.

We are indebted to William Howe Tolman, Ph. D., secretary of the League for Social Service and special agent for the Department of Education and Social

Economy for the United States Commission to the Paris Exposition, for a monograph prepared by him and published by the Social Service Press, of New York city, in which monograph he takes up the subject of "Industrial Betterment," and shows by illustrations and text what many industrial establishments have done and are doing to improve the conditions under which men, women and children labor. In this book several firms whose names are well known to our readers figure, among them the National Cash Register Company, of Dayton, Ohio; J. H. Williams & Co., of Brooklyn; the General Electric Company, of Schenectady; the Walker & Pratt Manufacturing Company, of Boston; Elgin National Watch Company; the Illinois Steel Company; Westinghouse Air-Brake Company; Proctor & Gamble Company, and others. Anyone who would know something of what is being done along this line and what it has been found practicable to do, should obtain a copy of this monograph. It ought to be generally read by shopmen, and will be found useful and suggestive in various ways.

Machine Shop Poetry.

Machine tools are in themselves rather less promising as subjects of poetical composition than are some other things, such as sunsets, ships, guns or even locomotives, aside from the fact that most of those who know a machine tool when they see it, or anything of its functions, are not often favored by visits from the muse. Nevertheless the task of making poetry out of machine-shop equipment has, it seems, been attempted; with what degree of success we leave our readers, who are at least as good judges as ourselves, to say, and we print some verses from a book which we are informed is soon to appear.

THE LATHE AND THE PLANER.*

Said the Lathe unto the Planer when the speed had slackened down,
And the gang had washed and hurried out of sight:
"I am sick of turning, turning like a useless circus clown;
I have half a mind to kill myself to-night.
What's the use in turning, turning—
Nothing teaching, nothing learning—
Just a tool in someone's keeping, doing what I'm made to do?
I am sick of grinding, grinding—
Never leading, always minding.
I am tired of being driven; aren't you?"

Said the Planer to its comrade: "You are wrong in what you say,
Tho' I sometimes grow aweary of my never-ending grind;
For I'm going back and forward, back and forward all the day,
And with naught but heavy burdens on my mind.
We have none of recreation,
We are poor and low in station,
From our dark and grimy windows we can nothing see of life;
But there's very much depending
On our labor never-ending;
We're of very much importance in this ceaseless round of strife.

"There's the men who have to tend us ten long hours of the day,
Who depend upon our service for their bread;
There's the proud and haughty owners with their millions laid away,
Who have made it from these faithful lives we've led.
If it were not for our turning
These poor men would cease their earning,
And mayhap their many children would go supperless to bed;
And our masters' wealth and glory
Would be quite another story,
And their stylish wives and daughters could no further lustre shed.

"So I think we'd best be silent with our dark and humble lot,
Doing good to friend and master day by day;
Going ever back and forward, round and round the same old spot,
Bringing happiness to someone who's away.
We have none of recreation,
We are poor and low in station,
From our dark and grimy windows we can nothing see of life;
But there's very much depending
On our labor never-ending;
We're of very much importance in this ceaseless round of strife."

JOE CONE.

*From forthcoming "Mill Ballads."

Personal.

Julius Fischer, managing director of the German Garvin Company, of Berlin, Germany, is making an extensive tour of this country. He expects to return to Germany in a couple of months.

Prof. O. E. McMeans, who has taught mechanical drawing as assistant professor at Kansas University, has resigned and gone to Richmond, Ind., to take charge of the drafting department of the Richmond City Mill Works.

Edward J. Willis, manager of the Richmond (Va.) electric railway system, and who has been an occasional contributor to our columns, was married on the 2d inst. to Bessie Fauntleroy, daughter of Judge Fauntleroy, of St. Louis.

John J. Grant, of the Grant Machine Tool Company, Cleveland, Ohio, which is to be removed to Franklin, Pa., and merged into a new concern, the Grant Tool Works, of which he is a director, vice-president and general manager, has been appointed also consulting engineer of the Franklin Air Compressor Company.

Henry H. Quimby, M. Am. Soc. C. E., formerly chief engineer of the Phoenix Iron Works, is proprietor of the Quimby Engineering Company, which has purchased the plant, patent rights, etc., of Thomas Shaw, M. E., at 915 Ridge avenue, Philadelphia, Pa. Mr. Quimby will continue the practice of civil and mechanical engineering as well as the manufacture of Shaw's mercury pressure gages, steam mufflers, propeller pumps, etc., at that place. The works will be under the superintendence of Frederick F. Kauffmann, who has been in charge of the mechanical portion of the business hitherto.

Obituary.

George Rehfus, senior member of the firm of George Rehfus & Sons, Philadelphia, large manufacturers of light machinery, died October 1, seventy-five years old. Mr. Rehfus was born in Wurtemberg, Germany, and came to this country in 1853, locating in Philadelphia. In 1862 he organized the American Sewing Machine Company, being its superintendent until 1880, when, with his three sons, the

(Continued on page 46.)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 22.

Dies & punches. Amer. Hdw. Co., Ottawa, Ill.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Gas engine castings. Box 181, Springfield, Mass.

For Sale—20 H.-P. boiler and engine combined. Box 1171, Springfield, Mass.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, Pa., build light machinery.

Model, experimental and fine tool work. Pollard Alling Mfg. Co., 35-37 E. 20th st., New York City.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

For Sale—One 7½ indicated 10 H.-P. Warren gas engine; in first-class condition; almost new; will sell at a bargain. Braddock Tool Co., Braddock, Pa.

Threads and gears; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. (postal order) by G. W. Dixon, Spring Lake, Mich.

Machine shop for sale in the eastern part of Wisconsin, doing a general repair and jobbing business, also selling engines, boilers, machinery, etc. Box 306, AMER. MACHINIST.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Drop hammer die sinker and designer. Box 361, AMERICAN MACHINIST.

Experienced draftsman wants a situation; machine tool or labor machinery preferred. Box 351, AMERICAN MACHINIST.

Situation wanted by toolmaker; has had charge; age 27; steady and sober. Address "Out," care AMERICAN MACHINIST.

Mechanical draftsman, with experience in designing small motors and electrical instruments. Box 360, AMERICAN MACHINIST.

First-class detailer wants position; references; 4 years' experience; graduate; East preferred. "Permanent," care AM. MACH.

Wanted—Position by first-class pattern-maker or draftsman; can give best of reference if desired. Address A. F., care AM. M.

Graduate electrical engineer wants position as first-class draftsman or designer; several years' experience. Box 350, AMER. MACHINIST.

Foreman pattern maker wishes change; 18 years' experience with some of the best manufacturing concerns; 5 years in charge. Box 352, AMERICAN MACHINIST.

Position as designer or draftsman on automatic machinery and machine tools; 10 years' shop and office experience, 4 as chief. Box 364, AMERICAN MACHINIST.

Mechanical engineer, with large experience in ore-conveying engines and traveling cranes, wants to make a change, from November 1. Box 359, AMERICAN MACHINIST.

Graduate mechanical engineer desires posi-

(Continued on page 46.)

(*Contined from page* 45.)

present firm was established. He was an expert mechanic and had invented many special devices in the line of his business.

John F. Allen, best known as the inventor of the Allen engine, later developed into the Porter-Allen engine, died in this city, October 4, seventy-one years old. Mr. Allen was a native of England and came to this country when twelve years old. He became a machinist and engineer and was a life-long inventor. For several years he had conducted a shop for building air compressors and pneumatic riveters at 370 Girard avenue. He had been a member of the American Society of Mechanical Engineers from the first year of its existence.

The "Bremen," one of the burned North German Lloyd steamers, has been so far repaired that she will be able to carry a cargo of 5,000 tons of bituminous coal to Dantzic, where she is to be lengthened and completely refitted. She is a four-deck twin-screw steamer, now 525 feet long, with quadruple-expansion engines.

A "cold physiological light" is a method of illumination which Raphael Dubois is attempting to promote. He has given a public exhibition of it at the Paris Exposition. The light is produced by luminous microbes.

New Catalogs.

The American Spiral Pipe Works, 64-66 Wabash avenue, Chicago, Ill., sends a pamphlet devoted to spiral riveted pipe. Size, 7x5 inches.

Tate, Jones & Co., First avenue, Pittsburgh, Pa., have sent a pamphlet containing the correspondence relating to a purchase of one of their gasoline engines. Size, 2¾x6¼ inches.

Bardons & Oliver, manufacturers of turret machinery, Cleveland, O., wish us to state that they will be very glad to send a copy of their new catalog to anyone who is interested enough to write for it.

The Rivett-Dock Company, Brighton, Boston, Mass., sends a pamphlet minutely describing and illustrating their new thread tool with a cutter in the form of a toothed disk. Size, standard, 6x9 inches.

"The Chain Gang, and Others" is the title of a pamphlet sent by the New Britain Machine Company, New Britain, Conn., and illustrating in particular their chain saw mortisers. It is of small standard size, 6x3½ inches.

The New Britain Machine Company, New Britain, Conn., has sent a catalog of portable metal tool racks for use in machine and blacksmith shops. An all-metal lathe pan for use under lathe is also shown. The pamphlet is 3½x6 inches, a standard size.

The Diamond Machine Company, Providence, R. I., sends us an advance section of its 1900 catalog. This covers the company's regular line of grinding machinery, countershafts, water tool grinders and bench tool grinding machines. A feature is the minutia of weights and measures given. Size, standard, 6x9 inches.

The Phosphor-Bronze Smelting Company, Limited, 2200 Washington avenue, Philadelphia, Pa., sends us a price list, No. 17, of phosphor bronze in the form of rolls and sheets, wire, circles, rods, wire rope, etc. The "Elephant Brand" phosphor bronze and other

(*Continued on page* 47.)

VALUABLE BOOKS JUST PUBLISHED.

Gas Engine Construction

A Practical Treatise Describing in Every Detail the Actual Building of a Gas Engine.

By HENRY V. A. PARSELL, Jr., and ARTHUR J. WEED, M.E.

Large 8vo. Very fully illustrated. 300 pages. Cloth.

Price, $2.50.

This book treats the subject from a practical standpoint. The principles of operation of Gas Engines are clearly and simply described, and then the actual construction of a half-horse power engine is taken up, step by step, showing in detail with half-tone illustrations of the actual work—the making of a Gas Engine.

Horseless Vehicles, Automobiles, and Motor Cycles.

Operated by Steam, Hydro-Carbon, Electric and Pneumatic Motors.

By GARDNER D. HISCOX, M. E.

Large 8vo. 459 pages 316 illustrations. Cloth.

Price, $3.00.

A Practical Treatise for Automobilists, Manufacturers, Capitalists, Investors, Promoters, and everyone interested in the development, care and use of the Automobile.

This book is up-to-date and very fully illustrated with various types of Horseless Carriages, Automobiles, and Motor Cycles, with many details of the same.

It also contains a complete list of the Automobile and Motor Manufacturers with their addresses, as well as a list of patents issued since 1856 on the Automobile industry.

Gas, Gasoline and Oil Engines.

By GARDNER D. HISCOX.

Third Edition, revised and much enlarged. 365 pages. Large octavo. Illustrated with 270 handsome Engravings. **Price, $2.50.**

Full of general information about the new and popular Motive Power, its economy and ease of management. Also chapters on **Horseless Vehicles, Electric Lighting, Marine Propulsion, etc.**

Mechanical Movements,

Powers, Devices and Appliances.

By GARDNER D. HISCOX.

Large 8vo. 402 pages. 1649 illustrations, with descriptive text. **Price, $3.00.**

A Dictionary of Mechanical Movements, Powers, Devices and Appliances, embracing an illustrated description of the greatest variety of mechanical movements and devices in any language. A new work on illustrated mechanics, mechanical movements, devices, appliances, etc., etc.

Combustion of Coal and the Prevention of Smoke.

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